

PRINCIPLES OF GEOGRAPHY

Part II

PRINCIPLES OF GEOGRAPHY

Part II

A Textbook in Geography for Class XI

M.H. QURESHI



राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

October 1989
Kartika 1911

P.D. 15T-BB

© National Council of Educational Research and Training, 1989

ALL RIGHTS RESERVED

- ☐ No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior permission of the publisher
- ☐ This book is sold subject to the condition that it shall not, by way of trade, be lent, re-sold, hired out or otherwise disposed of without the publisher's consent in any form of binding or cover other than that in which it is published.
- ☐ The correct price of this publication is the price printed on this page. Any revised price indicated by a rubber stamp or by a sticker or by any other means is incorrect and should be unacceptable

PUBLICATION TEAM

C.N. Rao *Head, Publication Department*

Prabhakar Dwivedi *Chief Editor*

Yacub Lakra *Editor*

Benoy Banerjee *Assistant Editor*

U Prabhakar Rao *Chief Production Officer*

Suresh Chand *Production Officer*

C P Tandon *Art Officer*

V B Meshram *Assistant Production Officer*

Cover: Rotterdam Port

Source: Fotobart Hofmeester Mathenesserlaan, 456^B, Rotterdam.

Inset Photograph: Afforestation in Japan

Source: International Society for Educational Information, Japan

Cover design: Sunil and Santo Datta

Rs. 9.00
Rs

Published at the Publication Department by the Secretary, National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi 110 016, lasertypeset at Shagun Composers, 125, Som Dutt Chambers-I, Bhikaji Cama Place, New Delhi 110 066 and printed at N. K. Enterprises, 4782/2-23, Ansari Road, Daryaganj, New Delhi 110 002

Foreword

'Principles of Geography: Part II' is a textbook on *Human and Economic Geography* for class XI under the 10 + 2 pattern of education. As a follow up of the National Policy on Education, 1986, NCERT revised the school curriculum for all stages. The present book has been prepared on the basis of the changes brought in the geography curriculum. Core elements such as 'protection of environment' and 'inculcation of scientific temper' as mentioned in NPE and POA have also been well reflected.

The 'plus two' stage in the 10 + 2 pattern of education is crucial in many respects. After 10 years of general education, students branch out at the beginning of this stage and are exposed to the vigours of a discipline for the first time. Since it is an entry point to higher education, students offering this subject for the purpose of pursuing their academic interest would need a broader and deeper understanding of the subject. For others, geographical knowledge should be useful in their world of work.

Against this background, geography curriculum at this stage has been articulated semesterwise. The first two semesters of class XI consist of courses in systematic geography i.e. Principles of Geography, Part I and Part II and the remaining two semesters in Class XII cover Geography of India. The study of geography and real appreciation of its nature and methodology remain incomplete if theoretical study is not complemented by practical work. Therefore, provisions for adequate field and practical work have been made in the curriculum for +2 stage, and hence a separate book entitled "Field Work and Laboratory Techniques in Geography".

The present volume deals with human and economic aspects of the world environment. Maps and diagrams form an integral part of geography. Special attention has, therefore, been paid to provide innumerable opportunities to students to develop necessary geographical skills such as reading and interpreting maps and diagrams meaningfully and also drawing them on the basis of available information and data.

This book together with its companion volume on Physical Geography provides the basis for the course content in class XII. The synthesis of the principles discussed in these two volumes and their application would be discernible in the other two volumes, viz (1) India: A General Geography, and (2) India: Resources and Regional Development.

I am grateful to Dr. M H. Qureshi of Jawaharlal Nehru University for writing the book originally in Hindi and also translating it into English within a very short period. Maps and diagrams of the book have been prepared by Shri S. Vig, for which I thank him. My thanks are also due to all teachers and subject experts who participated in the review workshop and provided their valuable com-

ments and suggestions.

Preparation of curriculum and textbooks requires considerable expertise and efforts in planning the work, screening, reviewing, editing and finally seeing the book through the press. For all this, I am grateful to my colleagues in the Department of Education in Social Sciences and Humanities especially Dr. (Smt.) Savita Sinha and Shri D P. Gupta

Curriculum construction and development of instructional materials is on-going process and hence suggestions from the students and teachers would be most welcome. These would be taken into account while bringing out the revised version of this book.

P.L. MALHOTRA

Director

New Delhi

National Council of Educational Research and Training

Contents

FOREWORD

v

Chapter 1	Natural Resources	1
Chapter 2	Renewable Resources: Forest and Fish	6
Chapter 3	Grasslands and Animal Rearing	18
Chapter 4	Non-renewable Resources: Minerals	25
Chapter 5	Energy Resources	35
Chapter 6	Conservation of Natural Resources	49
Chapter 7	Utilisation of Natural Resources	56
Chapter 8	Major Crops of the World	65
Chapter 9	Manufacturing Industries	86
Chapter 10	Location of Industries and Major Industries of the World	97
Chapter 11	Transport and Communication	109
Chapter 12	International Trade	127
Chapter 13	Population	133
Chapter 14	Settlements	143



GANDHIJ'S TALISMAN

"I will give you a talisman. Whenever you are in doubt or when the self becomes too much with you, apply the following test :

Recall the face of the poorest and the weakest man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him. Will he gain anything by it ? Will it restore him to a control over his own life and destiny ? In other words, will it lead to Swaraj for the hungry and spiritually starving millions ?

Then you will find your doubts and your self melting away."

M.K. Gandhi

CHAPTER 1

Natural Resources

NATURE has been benevolent towards the human beings. Ever since their appearance on the surface of the earth, they have been dependent on the natural resources for their subsistence viz edible plants and animals. In order to obtain these resources, which were available within their immediate environment, they interacted with nature with the help of primitive tools. The role of labour was, therefore, very important in this process. In the initial stages of the history of the economic development, they identified the resources available within their neighbourhood slowly and learnt to use them. Every resource has some utility for human beings but its utilisation is possible on the availability of appropriate technology. Although resources existed over the surface of the earth even during pre-historic time, man had neither the tools nor the technology to use them. Land, sunshine, wind, forest, and the wild-life were present much before the man appeared on the earth. But he could learn to cultivate the land, grow crops by protecting different plants, and run the wind and water mills by using the wind and water energy at much later stages of the economic development. Similarly for centuries, coal and mineral oil were present below the earth's surface, but the technology for their utilisation has been developed recently. Hence, these materials turned into resources only when they could be used. Human wants are unlimited and necessity is the mother of inventions. There are many

materials in the world whose utility is either not known to us or we do not have the appropriate technology to use them.

But the population growth will force the humanity to search for new vistas of development. Man will always find new directions as a result of the interaction between the level of his cultural development and the natural environment and new resources will continue to be unravelled.

What are resources? Wood is used for making furniture. The yarn obtained from cotton is used for weaving cloth. Machines, tools and other household goods are made of iron. Furnitures, clothes, machines and tools are more valuable than wood, cotton and iron, respectively. Besides, the form changes substantially from the raw material to the finished product. Any material, which can be transformed in a way that it becomes more valuable and useful, can be termed as a resource. In other words, it is possible to obtain valuable articles from any resource. Thus, land, water, livestock, forests, minerals as well as human beings are resources. Any material can be termed as a resource provided an appropriate technology is available for its transformation into more valuable goods. The development of technology is closely related with the scientific knowledge and technical skills of the people. Most of the developing countries obtain technology from developed countries but it requires capital investment. The developing countries of the

world are economically backward not because they lack in resources but because they lack in technology and capital. In fact history of the cultural development of man is the history of the development of technology. In every stage of their historical development human beings have fulfilled their needs of food, clothing and shelter. But different stages of the social history of mankind can be differentiated not on the basis of the kinds of production rather on the basis of the techniques used for production. That is how we differentiate between the stone age and the iron age. Productive forces are used in all kinds of production. Productive forces include human resources as well as the tools, machines and other objects with which the labour works. We require plough or tractor to till the soil, pumping set to lift the water and turbines to obtain hydroelectric power. Likewise sickle, spade and tools are included in the productive forces. Skilled and efficient productive forces ensure efficient utilisation of resources. This accelerates the economic development of a society and a country.

Types of Resources

Resources can be classified in a number of ways. The objective of classification would primarily decide how we put a resource under a particular category. The classification of resources depending upon different bases has been given in Fig 1.1.

(A) Classification of Resources on the Basis of Renewability

As soon as we start utilising a resource, it is but natural to worry about the period for which it will last. While some resources get exhausted soon, there are others which last for a long period. Thus depending upon the availability of resources over a period of time, resources may be classified into three categories—renewable or non-exhaustible; non-renewable or exhaustible and cyclic.

Resources, which can be renewed along with their exploitation are always available for human use. Hence they are called *renewable resources*. For example, forests are renewable. For obtaining wood from the forests, trees are felled. But the original forest cover may be maintained if through afforestation we plant the equal number of trees which have been cut down.

Formation of certain resources such as iron ore, coal and mineral oil has taken several thousand years. Once they are used, they cannot be easily replenished. Therefore, if they are exploited at a large scale, they will deplete fast. Hence, such resources are called *non-renewable* or *exhaustible*.

For certain resources, there is no final use as they can be used continuously, for example, water is used for industrial and domestic purposes. It can be cleansed and used again. Such resources which can be used again and again are termed *cyclic resources*.

B. Classification of Resources on the Basis of Origin

Resources found on the earth may be classified into two categories on the basis of their origin—*biotic* and *abiotic*.

Biotic resources are obtained from the biosphere. Forests and all forest products, crops, birds and animals, fish and other marine life-forms are the examples of biotic resources. Coal and mineral oil have also originated from organic matter and hence are kept under this category. While some biotic resources are renewable, some are non-renewable. For example, forest and livestock resources are renewable but coal and mineral oil are non-renewable.

All such resources which have been composed of non-living things are called *abiotic resources*. Land, water and minerals e.g. iron, copper, lead and gold are abiotic resources. Minerals are formed as a result of different processes taking place beneath the earth's surface. The process of

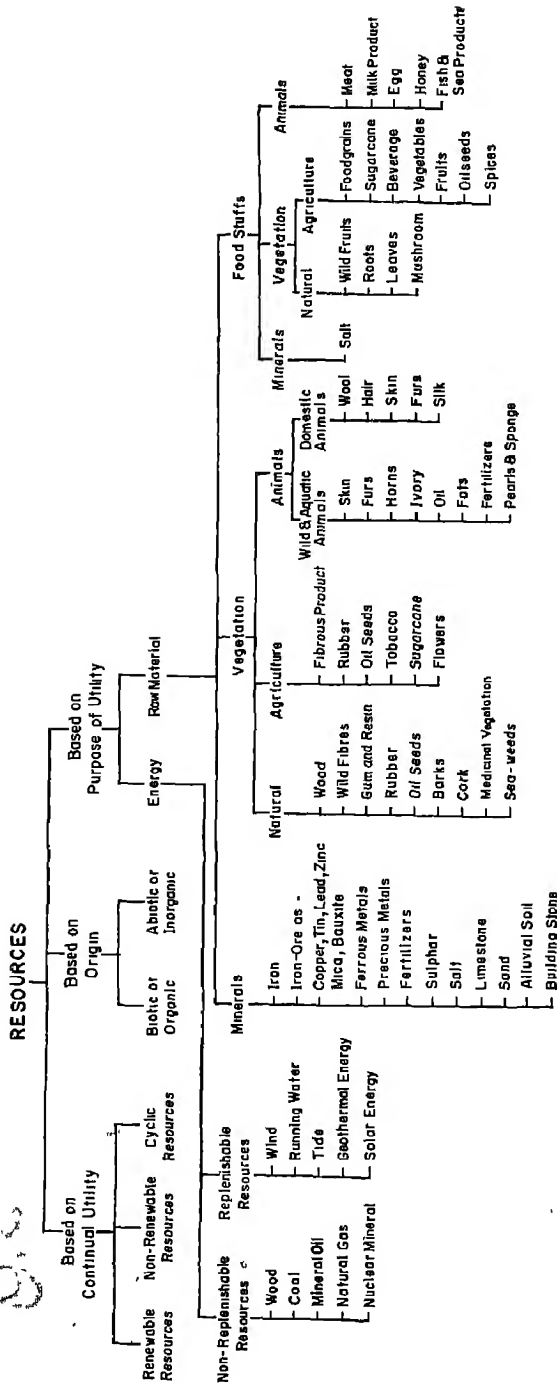


Fig 1.1 Classification of resources

their formation is extremely slow and hence these resources start depleting after their utilisation. While some abiotic resources are found extensively e.g. bauxite and iron, others are found in a limited area e.g. gold and silver.

Some abiotic resources are found as nodules in oceans. e.g. nodules of copper and manganese. India has obtained the technology of exploiting these mineral nodules from the ocean beds. The United Nations has granted permission to India to exploit the poly-metallic nodules over an area of 150,000 Sq km in the Indian Ocean. India is the first country to obtain such a right. The National Institute of Oceanography, Goa, has played a leading role in the research and development of this mining technique.

(C) Classification of Resources on the Basis of Utility

Every resource has some utility. Some are used as food articles, some as raw materials and others as the sources of energy. In the early stages of the economic development, man first obtained those resources which were used as food. Since its list is long, only some examples have been given in Fig 1.1 Salt available in the form of a mineral is a food article. It is also known as Lahori Salt in north India. A large amount of food is obtained from vegetation. Besides wild fruits and roots, man has obtained cereals, beverages and vegetables through agriculture. Milk, meat and eggs are obtained from domestic animals and birds. Many food items are products obtained from oceans.

Raw materials form the basis for industrial development and are considered an important factor. These are derived from minerals, vegetation (natural and cultivated) and animals (wild and domestic). Materials such as iron ore, coal,

limestone, bauxite etc., are used as raw materials in different industries.

Some raw materials such as wood, wild fibres and seeds, barks, corks and sea-weeds are obtained from natural vegetation. Similarly, examples of agricultural raw materials are cotton, jute, rubber, oil-seeds, tobacco, sugarcane and beetroot. Animals, both wild and domesticated, provide different kinds of raw materials. Hides, furs, horns, ivory etc. are obtained from wild animals. Fish, sponge, fungi etc. are used for making various products. Likewise we get different kinds of raw material from domestic animals e.g. wool and hide from sheep, yak, goat and camel and silk from cocoon.

Energy is required in every sector of the economy. Agriculture, forestry, mining, transport and communication etc. depend upon one form of energy or the other. Electricity or diesel is used for different operations in agriculture, e.g. driving tractor for ploughing, using pumping sets for irrigation and running harvestors and threshers for harvesting the crop and separating the grains respectively.

Development of industries is based on the energy resources. Similarly, development of trade, transport and communication etc. also depends on energy resources. Some energy resources are exhaustible e.g. coal, mineral oil, natural gas and atomic minerals. But some other energy resources have unlimited reserves e.g. running water, solar energy, tidal energy, wind energy and geothermal energy. Conservation of exhaustible energy resources is extremely necessary because economic development in the future and its continuity would depend upon the availability of these resources.

EXERCISES

Review Questions

1. Write short answers:
 - (i) What are resources ? Discuss the role of resources in the economic development of a country.
 - (ii) Name the energy resources. Why should we conserve them ?
 - (iii) "All biotic resources are not renewable". Discuss the statement.
 - (iv) What role technology has played in making the resources more valuable ?
2. Distinguish between:
 - (i) Biotic and abiotic resources
 - (ii) Renewable and non-renewable resources.
 - (iii) Energy resources and raw materials
3. Classify the following into renewable and non renewable resources:
 - (i) Mineral Oil
 - (ii) Wood
 - (iii) Soil
 - (iv) Copper
 - (v) Livestock
 - (vi) Iron ore
 - (vii) Wheat crop
 - (viii) Jute
 - (ix) Thorium
 - (x) Human resources
4. Give two examples each of the following:
 - (i) Biotic resources which are renewable.
 - (ii) Biotic resources which are not renewable.
 - (iii) Abiotic resources which are renewable.
 - (iv) Abiotic resources which are non-renewable.
5. Prepare a list of the resources which are utilised in your household and indicate which resources are renewable and which are non-renewable.

CHAPTER 2

Renewable Resources: Forest and Fish

THE countries having large quantities of renewable resources can provide stability to their economic development. With judicious use and appropriate conservation measures, these resources can be used continuously for a very long period of time. Man, from his early stages of development, has been dependent upon forests. Hunting and gathering from the forests were the main occupations. Thus forest as a resource has always been important. It plays an important role in keeping the environment free from pollution, preventing soil erosion, increasing humus content in the soil and making the climate mild.

Besides hunting and gathering from the forests, people living near the water bodies used to catch fish. Fishing was common in the coastal areas and on river banks even in the primitive stage of development. Fish is an important food item of human beings even today. It is a very rich source of protein. However, the small scale fishing of the earlier times has now taken the form of a large scale industry.

Forest and fish, both are examples of renewable resources. These resources will remain in use for times to come. It is, therefore, important to study their geographical patterns of distribution and utilisation.

FORESTS

Forests influence the human life directly and indi-

rectly. We obtain wood for fuel, buildings, agricultural implements, furniture and paper. Many secondary products like gum, resin, wild rubber, chicle are also collected from forests. Indirectly, forests make the climate mild. They check the environmental pollution and help in conserving the soil. As a result of the growing world population the demand for wood and other forest products is bound to increase. It is, therefore, imperative to look at the forests as 'renewable resources' which calls for large scale afforestation and conservation.

Types of Forests

There are numerous species of trees found in the world but their size, type and other characteristics depend upon different geographical factors. Of these, climate, soil, land forms and duration of sunlight are the most important factors. Regions which are either too cold or too dry, do not have forests. On the other hand, regions with adequate rainfall, deep soil, sun facing slopes and long photo-period have valuable forests. On the basis of their homogeneous nature, forests can be classified under the following heads.

Tropical Hardwood Forests

These are found in the regions of high temperature and high rainfall. Such forests include the equatorial and monsoon forests. Natural vegetation of these two regions vary due to the differ-

ences in the rainfall and temperature characteristics. Therefore, the tropical hardwood forests are divided into two types—equatorial and monsoon forests:

Equatorial Forests: These forests extend between 5° north and 5° south of the equator. They are found in the Zaire basin of Africa, the Amazon basin of South America and with some modifications in Malaysia and Indonesia. ▶

The forests of Malaysia and Indonesia are different from those of the Amazon and the Zaire basins because of the modifying influence of the sea. The equatorial forests in the Amazon basin are also known as *selyas*. These forests are very dense due to high temperature and rainfall throughout the year. Trees in these forests compete with each other for sunlight. Thus they grow taller and taller. If they are viewed from above, they present a layered structure. Numerous creepers like *liana* climb the trees. Due to high humidity throughout the year epiphytes growing on trees could be seen commonly. The forests always appear to be green because trees of different species shed their leaves at different times. The forests are infested with poisonous insects, flies and snakes. High temperature and humidity are also responsible for different kinds of diseases. Most of the trees in these forests have hard wood. One of the problems of the economic exploitation of these forests is the scattering of trees of one specie over a wide area. In other words, trees of any one specie is not found in one area. As a result, one has to move in a big area to get them in a large number. Mahogany, rose wood and ebony are important hard wood trees which are economically useful.

Monsoon Forests : These forests are found in central and north-east India, Myanmar (Burma), Vietnam, Thailand, Laos, Cambodia and north-east Australia. The main characteristic of monsoon climate is the limited period of the rainy season. Duration and amount of rainfall affects the density of forests. Hence monsoon forests are not very dense. Their chief characteristics are

dense under-growth and bamboo groves. Sal, teak and sisam are important trees of the region. Besides, in the areas of high rainfall, bamboos, rubber, cinchona, mahogany etc. are found. Woods of these forests are economically valuable. Since they are not as dense as *selvas*, their economic exploitation is also easier. Due to high density of population in the monsoon region, demand for wood is also high. In many parts of monsoon lands over-exploitation has adversely affected the forest resources.

Temperate Deciduous Hardwood Forests

Temperate regions of moderate temperature and rainfall like central and western Europe, north-eastern U.S.A., southern Soviet Union, Central America, eastern Asia viz. Korea, Japan, China etc. have the hard wood deciduous forests. Trees of these forests shed their leaves at the onset of the winter and remain without leaves throughout the winter. Like the tropical rain-forest, these forests also have trees of different species mixed together. Woods from these forests are strong and durable. Unlike the tropical rain-forests, woods of these trees are lighter and easier to work on. Important trees of this forest are oak, birch, chestnut, maple, walnut and elm. They provide valuable wood. They are used as building material and for the ship-building industry. Hence they have been commercially exploited to a great extent. Due to favourable climate and high density of population in the middle latitudes, agriculture and industry have developed very fast. As a result, forests have been cleaned from a large area and the total area under forest has reduced constantly.

Temperate Coniferous Softwood Forests or Taiga

Except for a few hill-slopes, most of the coniferous forests are confined to the northern latitudes. These are located between 50°N and 70°N latitudes. They are found in an extensive belt in the northern hemisphere running through

Canada, Norway, Sweden, Finland, Baltic region of the Soviet Union, and Central and Eastern Siberia. In Siberia, they are known as *taiga forests*. They are found on the mountain slopes, between altitudes of 1500 and 2000 metres. Forests on the slopes of the Alps and the Himalayas are of this kind. In the southern hemisphere, the extent of these forests is limited.

Coniferous trees are tall, straight with narrow, needle like leaves. Most of these are evergreen but some trees like *larch* are deciduous. There is no under-growth in these forests and the wood is soft. These forests are commercially valuable as one specie of tree is found over extensive areas. Pine, cedar, spruce, fir, red wood and walsum are some of the important trees of these forests.

Forest Products and Economic Activities

Economic activities associated with the forests are of two types: gathering and lumbering.

Gathering

Gathering from the tropical forests is carried out on three scales with different orientations; viz., small scale subsistence gathering, commercial gathering for export, and organised gathering along with primary processing. The wood in the tropical forests is hard and moreover, the trees do not occur in pure stands. As a result, lumbering as an economic activity, is not very important in these forests. Instead, gathering of some valuable products is the main economic activity. Chickpea is collected from Zapote tree in the forests of southern Mexico, Honduras and Brazil. Rubber and *Balata* were gathered from the forests of South America and western Africa but in the modern times gathering of wild rubber is almost nil. Balata is still collected from forests. It is used for making marine cables, belts for machines and cover for golf balls. Coconut is collected from the coastal part of India, Sri Lanka, Malaysia, Indonesia and Philippines; Palm nut

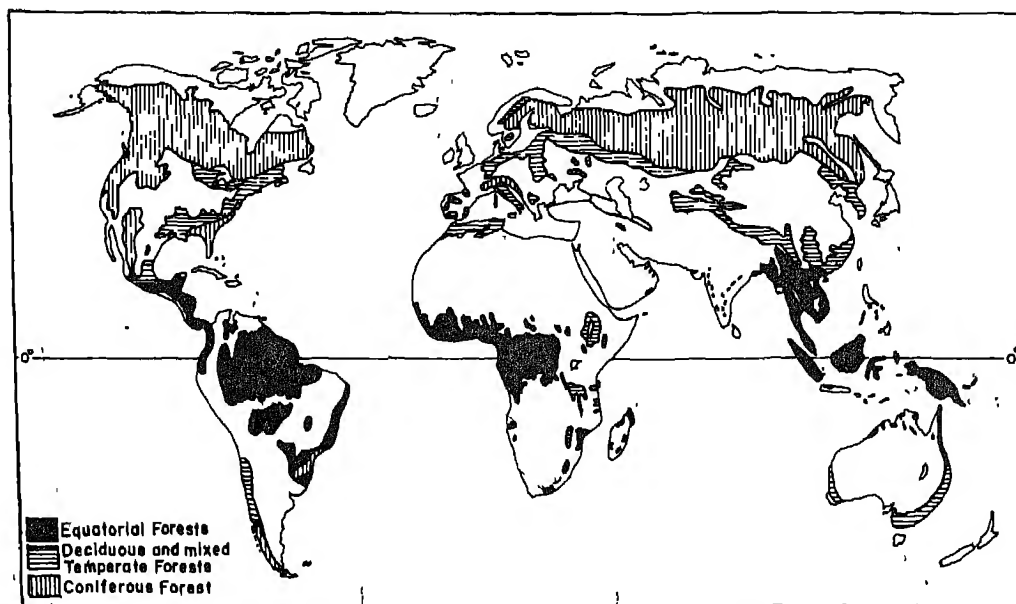


FIG 21 World—Major forest areas

from Nigeria, Malaysia, and Indonesia; and ivory nut from the forests extending between Panama and Ecuador. Some fibrous products are also obtained from tropical forests e.g. toquilla for making Panama hats, cotton from kapock tree for making pillows and mattresses and Manila hemp (abaca) for making ropes.

There are a number of medicinal plants in the tropical forests which are collected for making medicines. For example, cinchona is used for making quinine, a medicine for curing malaria. Bark of chestnut, quebracho, hemlock, oak, mangrove and acacia arabica are collected for obtaining tannin material. Gathering has almost disappeared from United States of America and western Europe.

Gathering is still the main economic activity of some tribes in the world, for example, pigmies of the Zaire basin depend on gathering for their subsistence. In the following pages, you will get acquainted with their physical environment and way of life.

Pigmies of the Zaire Basin

Pigmy is a tribe living in the dense forests of central Africa. Their number is largest in the Zaire basin. Pigmies are of short height, some of them being only 90 cms. tall. They are of dark complexion with black and wooly hair. You have already read about the physical environment in which they live. This region experiences high temperature coupled with heavy rainfall throughout the year. As a result, this region has a dense forest. Besides, high temperature and high humidity have together made it a region of numerous kinds of insects and poisonous snakes. Thus people of this region live in adverse environmental conditions which have directly influenced their economic activities and life styles.

Due to constant high temperature throughout the year, the pigmies do not wear much clothes. Their clothes are generally made of barks and

leaves. Their staple diet includes roots, fruits, honey, insects and meat. The pigmies make their abodes on the branches of the trees and thus save themselves from marshy land, dampness and poisonous insects on the ground. Dense forests obstruct transportation. Hence, they generally settle on the river banks so that transportation could be easier, which is mainly done by small primitive boats. They do not live in village like settlements, rather their huts are widely scattered in the forests. Major occupations of Pigmies are gathering and hunting. They also practise subsistence agriculture wherever they succeed in clearing the vegetation and grow yam, cassava, banana and beans. They practise shifting cultivation. Heavy rainfall causes soil erosion and leaching. The shifting cultivation is responsible for degradation of forests.

The information about the size of the Pigmy population is scanty and there are only estimates. It is well known that except for the equatorial regions of south-east Asia, the population density is generally very low in other parts.

These people are not very much influenced by modern social organisations and economic development but certain amount of change is visible. They have started participating in marketing by bringing the materials gathered in the forests for sale to the market. They have also started using the industrial products but their standard of living is still very low.

Lumbering

The greatest importance of forests has been as the source of timber. It is used as a fuel, in making implements and building houses and ships.

Since ancient times people in the tropical forests have been obtaining wood for fuel, agricultural implements and construction of houses from the forests. But lumbering on a commercial scale is not a major economic activity over large areas in tropical forests. In this region, it is done only

in the coastal areas, river valleys and on densely populated highlands which are accessible. Mahogany is felled in the forests of Honduras, Dominican Republic and coastal regions of western Africa. Teak is a valuable wood in India, Myanmar (Burma), Thailand, Laos, Cambodia and Jawa in Indonesia and is extensively exploited in these countries.

Lumbering is an important economic activity in the temperate regions of the world. It is a large scale organised activity. Trees in these forests are found in pure stands over large areas and the wood is soft. It is easier to fell these trees. These forests are comparatively less dense than the tropical forests. Hence, these are accessible. They have been connected by a network of railways and roads. During winter the surface is covered with snow. It is easier to move the logs to the river beds on the slippery surface. These forests lie close to the economically developed countries where the demand of wood is also higher. Thus, lumbering in these regions is quite developed.

There are several important regions of this economic activity. In the Rocky Mountains of North America and the temperate coniferous forest belt of Canada, lumbering is an important activity. Due to heavy rainfall dense forests are found on the slopes of the Rockies. Earlier, lumbering was done extensively from Minnesota to Maine in the United States of America. But now, the forest resources have almost depleted. In Canada, lumbering is done from the Pacific coast in the west to the Atlantic coast in the east.

In Europe, lumbering is done in Norway, Sweden, Finland, the slopes of the Alps and the hills of central Rhine valley. In Soviet Union, coniferous forests are found from the Baltic sea coast to the Okhotsk sea coast. Lumbering is more important in the western part of Siberia than its eastern part because the density of population as well as demand for timber are low in the eastern part. There has been extensive exploitation of forests in China and hence they are now confined only to the inaccessible mountainous areas.

In Japan, emphasis on conservation of forests is more than its exploitation. Due to extensive mountainous region, about two-thirds of its area is under forests.

Temperate forests in the southern hemisphere are extremely limited. These are found in small pockets in South America, South Africa, eastern Australia particularly Tasmania, and New Zealand.

Lumberjacks of Canada

Lumbering of soft wood in the coniferous forests of Canada is a major occupation. The winter season in Canada is long and therefore, agricultural activity is limited within the short growing period. The farmers have plenty of leisure time as there is no work in the fields during winter. They utilise this time by engaging themselves in lumbering. They migrate to the northern forests along with their families, where they get employment. These people, who are engaged in agriculture and other occupations in the southern part and seek employment as lumberers in the coniferous forest belt of the north are known as *lumberjacks*.

Lumbering in Canada is highly mechanised. Trees are felled by motorised sawing machines. The chopping off the branches and logging are also done by automated saw machines. In order to maintain uniform length of logs, markings are put on trees. Trees are cut on these marks. The logs are pulled by tractors to the river beds. Snow-covered surface is slippery and therefore, it is easier to pull the logs. Demand for wood in the developed economies of United States of America and Canada is high. As a result lumbering is done at a large scale.

The lumberjacks work under harsh conditions during the period of their sojourn. Winters are severe. Though they do not enjoy the comforts of the city-life, certain basic amenities are made available to them. These include in particular, educational and health facilities. They have

mobile schools and health centres which move on rail coaches and connect camps of the lumberjacks. Children of these lumberjacks receive their education in these mobile schools. These schools in rails coaches finish the teaching work in one camp at a particular time and move on to another camp. Similarly mobile hospitals also move from one camp to another. After the winters are over the lumberjacks return back to the agricultural regions and resume their original occupations.

The logs are floated through rivers to the saw mills located in the cities, where a wide range of machineries are used for cutting the logs and making other products. In these urban centres, industrial activities based on timber begin. These large scale industries are also highly mechanised but they are located outside the sphere of the work of lumberjacks.

Conservation of Forests and Wild-Life

Forests and wild-life are essential for the ecological balance of any area. Besides being economically important, forests play an important role in checking the air pollution and soil erosion. They save the hill-slopes from land-slides. In deserts, they reduce the wind velocity and thus control the aeolian activity. It is believed that dense forests attract rainfall. They enrich the underground water reserves.

Wild-life helps in promoting economic activities which bring money quickly such as tourism. It is absolutely necessary to maintain the diversity of the wild-life. Conservation of forests and wild-life have to go together because existence of wild-life is dependent on forests. Conservation methods of these resources have been discussed in detail in chapter 6.

FISH

Fishing is an ancient economic activity. Even today in many parts of the world it is practised at a small scale. But in some countries it has

taken the form of a large scale mechanised industry based on modern techniques. With the increase in population and pressure of land resources, man is bound to turn towards the ocean. It is an important occupation in coastal areas. About 8.4 crore metric tonnes of fish is caught every year in the world. Besides being a rich source of protein fish is also used for preparing poultry feed and fertilisers. It is believed that there are more than 30 thousand types of fish. They survive in oceans from the equator to the poles, in rivers as well as in the cold water of the glaciers. Thus, fish has tremendous capacity to adapt itself in varied temperature conditions.

Types of Fish

Fish can be classified in two ways. On the basis of the nature of the water, fish can be classified into two groups—fresh water fish and marine fish. Fish caught from rivers, tanks, lakes and reservoirs are called fresh water fish. Marine fish are caught from seas and oceans. On the basis of the location, marine fish are further classified into that of coastal region and the open sea.

The fish in the open ocean are caught from two areas. The light loving fish are found near the ocean surface and form schools. These are known as pelagic fish e.g., tuna, salmon, pilcard, sardines, mackerels and herrings. Some fish are found near the ocean bottom. In this zone water is cold and there is no light. Here, fish are not found in schools. These are demersal fishes e.g. cod, halibut, haddock and flounders, etc.

Distribution of Fisheries in the World

Though fishing is possible throughout the ocean, it is done on a large scale in four regions.

North-West Pacific Region

This zone extends from Bering sea in the north to Philippine sea in the south. The warm current of Kuroshio and the cold current of Oyashio meet

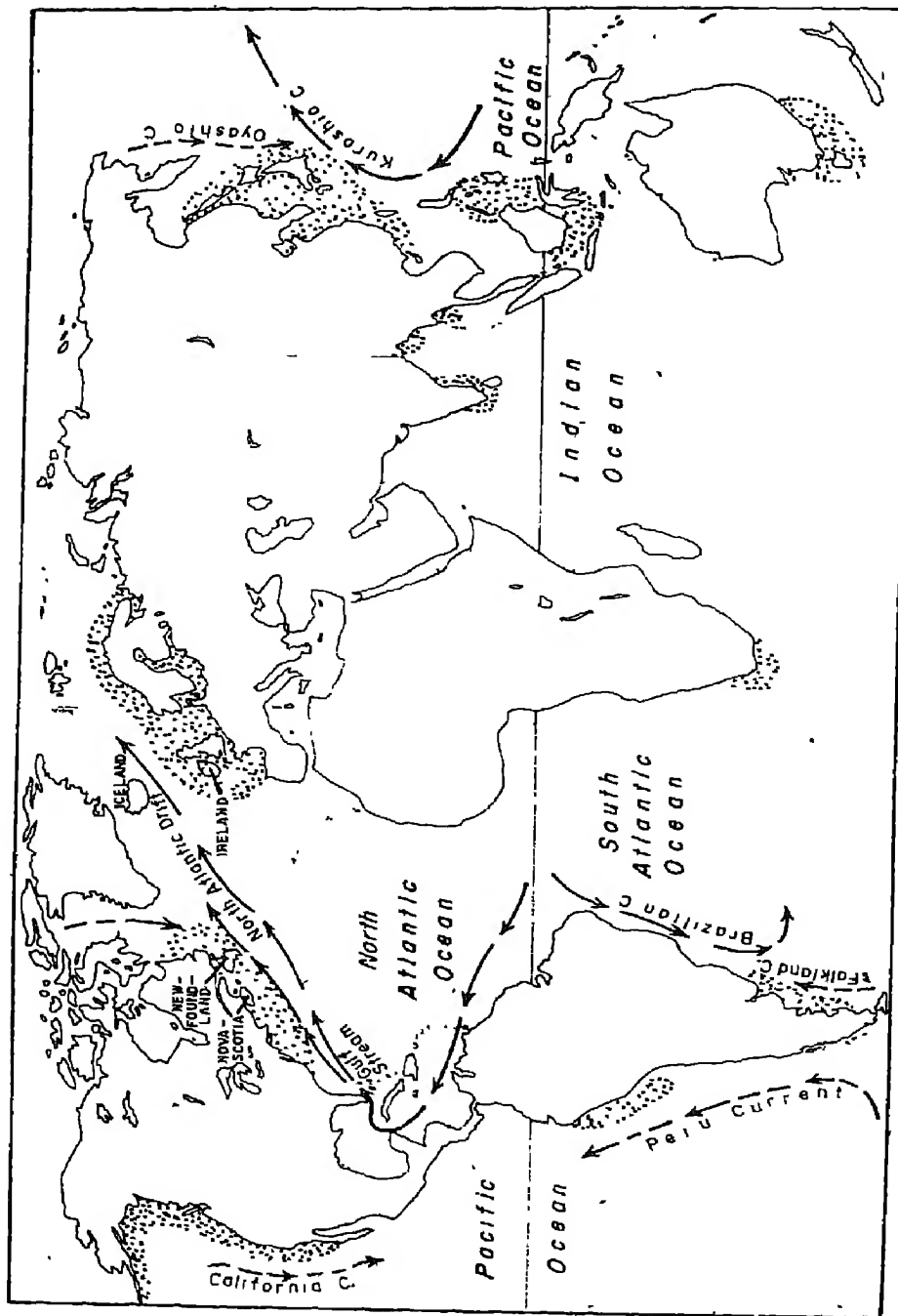


FIG 2.2 World—major fishing grounds

in the continental shelf of this region near the coast of Honshu. It provides favourable conditions for the growth of plankton, which is the food for fish. Due to availability of plankton in plenty, this region supports very large fish population.

Japan is the leading fishing nation in this region. In 1985 Japan accounted for 13.5 percent of the total fish catch in the world. History of fishing in Japan is quite old. Now it has become a large scale industry. Here big corporations with modernised ships and equipments organise the fishing. The big ships go in the open ocean and send back their catch to the large ship. These big ships are in fact floating factories as the fish is packed and exported from the ship itself.

Besides Japan, large scale fishing is also done in Soviet Union, China, Korean Democratic Peoples Republic and Korean Republic.

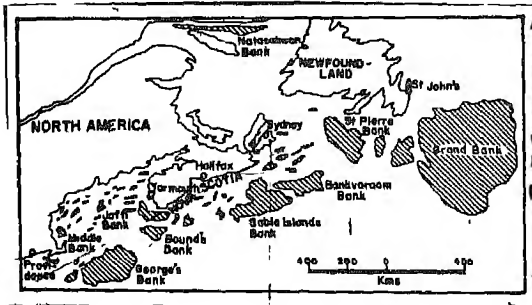


FIG 23 North America—major fishing grounds

North-East Atlantic Region

This zone extends from the Arctic Circle in the north to the borders of the Mediterranean sea along the western European coast. Locate the important fishing banks of this region on the map. Dogger Bank of the North Sea is the most important fishing bank of this region.

The warm water of the North Atlantic Drift keeps the coast open throughout the year. In Europe, the wide continental shelf, long fiord

coastline and lack of cultivable land in the coastal areas have been responsible for the development of fishing. Major fishing countries in this region are Norway, Sweden, Denmark, Netherlands, France, Iceland, and the United Kingdom.

Norway is the most important fishing country in this region. The fiord coast of Norway has provided good sites for harbours. Besides, the warm water of the North Atlantic Drift keeps the coast open throughout the year. Since a large part of the country is hilly, cultivable land is limited. Hence the people have taken up fishing as an occupation. Cod and herring are the important fish species caught in Norway. There is a great demand of fish in industrially developed countries of Europe. Federal Republic of Germany, Spain and Portugal are other countries of the region where fishing is important.

North-West Atlantic Region

Although the major fishing zone extends between Long Island and Newfoundland, fishing is also done both north and south of this region. The western boundary of this zone is formed by the coastline of U.S.A. and Canada. The continental shelf is wide and a number of banks are located on it. The zone of shallow water in the ocean is known as *bank*. The most famous bank of this region is the Grand Bank. The other important bank is the George's Bank. The warm water of the Gulf stream and the cold Labrador current meet in this region. Therefore, planktons are abundant in this region and they support fish in large numbers. The growing season in the provinces of Novascotia and Newfoundland is limited. There is also a lack of cultivable land. Thus, the people of these provinces were attracted towards exploitation of fish resources. There is also great demand of fish in the developed countries of USA and Canada.

Fish caught in this region are cod, perch, herring and haddock. Lobsters and oysters are also caught. The maximum number of fish is caught

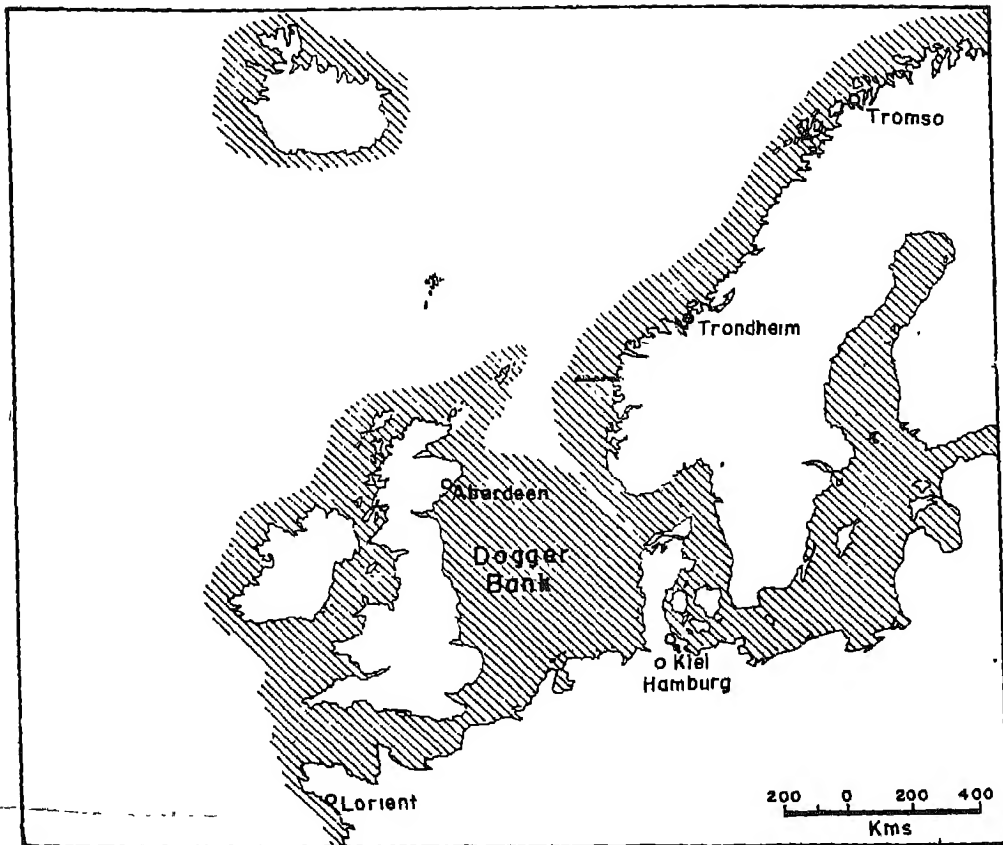


FIG 2.4 Major fishing grounds of Western Europe

from the coasts of Newfoundland and Nova Scotia. In warmer water of southern part of sea, shrimp is an important catch. Chesapeake bay is famous for oyster catches. Halifax, St. John, Boston and New York are important fishing ports of this region.

North-East Pacific Region

This zone extends from Alaska to California along the western coast of North America. Here the fishing countries are USA and Canada. Towards north, the hinterland of the coast is hilly and has low density of population. However, on the coast of USA, San Francisco region and California Valley are the developed areas having

good harbours. Salmon, pilchard, tuna, sardines and halibut are important species of fish caught in the region. California has developed fish canning industry. These industries are located along the coast. Anchorage, Vancouver and San Francisco are important fishing ports.

Regional Pattern of Fishing

Fish catch in the world has been increasing. Fish catch of 7.2 crore metric tonnes in 1980 has increased to 8.5 crore metric tonnes in 1985. It however does not mean that fish catch has increased uniformly in all regions. In some regions, fish catch has decreased as well. The pattern of fishing in the world is clearly depicted

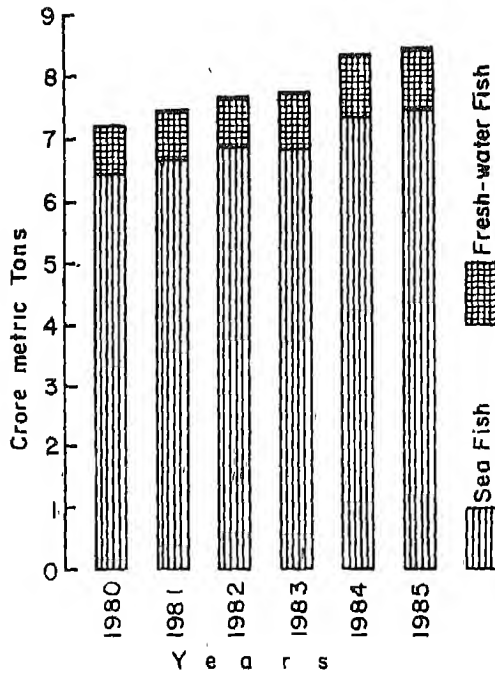


FIG 2.5(a) World—fish catch by type

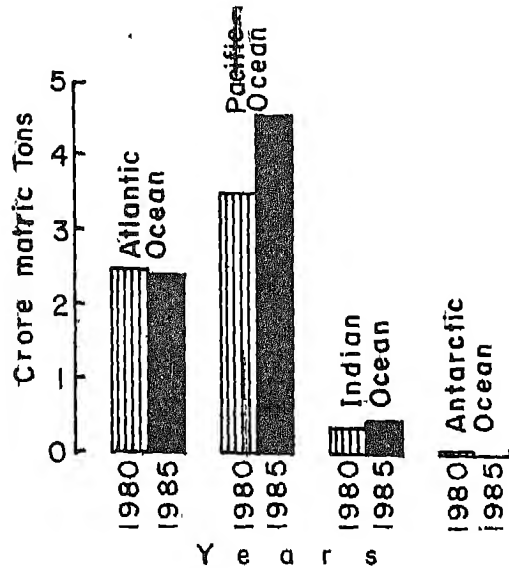


FIG 2.5(b) World—fish catch by areas

in Fig 2.2. It clearly shows that fishing in the Pacific Ocean has been increasing consistently but it has been decreasing in the Atlantic Ocean. Compared to 1980, fish catch in 1985 has decreased by 5.7 lakh metric tonnes.

Similarly fish catch in the southern seas has also decreased. Though this loss is not in terms of the total value, it does indicate towards the problems of fishing.

Major Problems of Fishing

Ocean is the storehouse of resources. Since ancient time, people have exploited these resources. However, in the exploitation of fish, an easily available source of protein for man, certain kinds of problems are being confronted today. They are as follows:

Over Fishing

In contrast to the past, fishing at present is done on a large scale with the help of modern tech-

niques. The capacity of modern fishing boats has increased considerably. Those fish species which form schools can be caught easily. If they are caught frequently, they do not get sufficient time for their growth. Halibut and salmon are such endangered species. Sometimes the nets used for fishing have such small gaps that small and immature fish are also caught. Therefore, the use of such nets has been banned under the provisions of international laws. Likewise, the number of seals caught in a year has also been fixed,

Ocean Transport

Some of the Ocean routes pass through regions known for fishing. North-east and north-west Atlantic Ocean are the best examples. The ships cruising between the ports of western Europe and eastern U.S.A pass through Dogger Bank and George's Bank. It is one of the busiest trade routes. Ships of this route cause water pollution. They are also dangerous for fishing boats. They

can damage nets and trawlers and thus obstruct fishing.

Pollution

Ocean water is generally polluted by the rivers carrying the effluents of cities and industries as well as the fertilisers, pesticides and insecticides which are used in agriculture. Pollution is more on the western and eastern coasts of the Atlantic Ocean because of industrialisation. This may be one of the reasons for the decline in fish catch.

Nuclear tests conducted in the oceans is dangerous for aquatic life. The leakage from the trans-oceanic oil pipelines, wreckage of oil tankers, oil discharged from the ships on the oceanic routes and mining in the ocean-beds have aggre-

vated the pollution of water in oceans. This in turn, endangers fish and other marine life-forms.

Due to water pollution, several fish species are on the verge of extinction. Earlier, sardines were found abundantly on the coasts of France and California, but now their population has substantially decreased.

It is very important to control the pollution level of the ocean waters and to conserve the fish and other aquatic life. In many countries, rivers continue to discharge organic and inorganic effluents from industries, insecticides and other harmful chemicals into the sea. This has to be checked. Only pollution free ocean water can ensure abundance of fish and other marine resources.

EXERCISES

Review Questions

1. Answer the following questions briefly:
 - (i) Divide the world into major forest regions and describe any one region in detail.
 - (ii) Discuss the main characteristics of the equatorial forests. Why is the economic exploitation of these forests difficult?
 - (iii) By providing a description of the economic activities of the Pygmies in Zaire, show the way they have adapted themselves to their environment.
 - (iv) Why has lumbering developed more in the temperate coniferous forest?
 - (v) Write a note on the development of fishing in the North-East Atlantic and North-West Pacific regions.
 - (vi) Discuss the main problems of fishing in the world.
2. Distinguish between:
 - (i) Selvas and monsoon forests
 - (ii) Deciduous and coniferous forests
 - (iii) Pelagic and demersal fish.
3. Represent the following data with suitable diagram and answer the questions given in the end.

Production of Sawn wood in the world - 1984

<i>Region</i>	<i>Sawn wood (in'000 Cubic metres)</i>
North America	138,000
Western Europe	66,000
Oceania	5,000
Africa	8,000
Latin America	26,000
Asia	63,000
Eastern Europe and Soviet Union	118,000
Others	30,000
World	454,000

Give Reasons:

- (i) Western Europe and North America together account for about 50% of the sawn wood in the world.
 - (ii) Asia and Latin America produce low proportion of sawn wood in the world inspite of their big areal extent.
 - (iii) Countries of the socialist economies produce higher proportion of sawn wood.
4. Show the following on the map of the world.
- (i) Temperate forest region
 - (ii) Fishing area of North-West Atlantic and North-West Pacific Regions.
 - (iii) Grand Bank, Dogger Bank, George's Bank and China Sea.

CHAPTER 3

Grasslands and Animal Rearing

A LARGE area of the world is under grasslands. Here, the main occupation of people is grazing and rearing of animals. Grasslands are closely related to rainfall. Grasses grow in plenty in the regions of low rainfall. On the basis of location, grasslands may be divided into two types—tropical grasslands and temperate grasslands.

Tropical grassland are located between the equatorial rainforests and hot deserts. These areas receive an average annual rainfall of about 100 centimetres, most of which occur during summers. Winters are mainly dry. These grasslands are known as *Savanna* and are located on the highlands of Brazil and the Orinoco basin in South America, north and south of Zaire basin in Africa, highlands of eastern Africa, South Africa, north Australia and New Zealand.

In these grasslands, trees are few and scattered. Grasses are thick, rough and tall. Generally, their heights vary from 1.8 metres to 3 metres. They generally decrease in height while going from the equator towards hot deserts. They lack in nutrients. Therefore, cattle in spite of their large number, do not provide quality products.

Temperate grasslands are found in the temperate belts of North and South Americas, Asia, Australia and New Zealand and on the plateau of South Africa. The average annual rainfall in these areas varies from 25 to 75 cms. The rainfall is received throughout the year but slightly more in summer months. The low temperature

makes the rainfall more effective. Grass is nutritive and hence useful for the cattle. In many parts of the world, these grasslands have been converted into extensive fertile agricultural lands. The temperate grasslands are also of two types—steppes and prairies. Grasslands with short grasses are called *steppes*. In semi-arid areas, short grasses with a height of 10 to 20 cms cover the land like mats. These are more extensive in the northern hemisphere.

Prairies are those grasslands where grasses are comparatively taller. Being located in humid regions, there is an extensive cover of 40-60 cm tall grasses.

Temperate grassland are known with different names in different regions. For example, these are called *prairies* in North America, *pampas* in Argentina, *veldt* in South Africa, and *downs* in Australia. Livestock rearing is a developed economic activity in the temperate grasslands.

Grazing and rearing of animals such as cattle and sheep in an organised manner started as an occupation for obtaining milk, meat, wool, and skins from them. It is indicative of the economic development of man from primitive to modern times. It is only after certain economic activities such as gathering, collecting and hunting that man tried to obtain animal products by investing human labour. Now instead of exploiting natural resources he turned towards their protection, procreation and conservation.

Livestock herding and rearing is an important

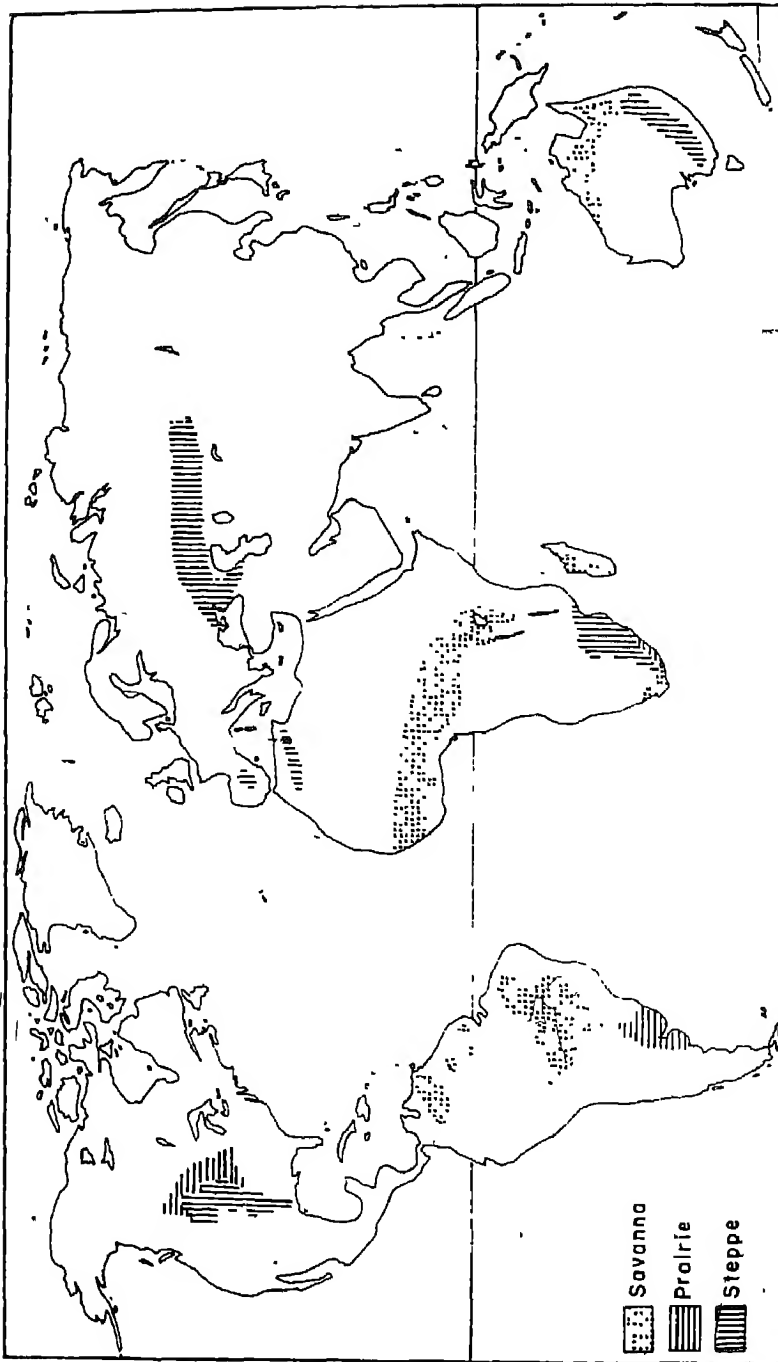


FIG. 3.1 World—distribution of grasslands

economic activity of the grasslands even today. In some areas it is practised for subsistence and in others for commercial purposes. In some parts of the world it is still prevalent in the primitive form. On contrary, in some countries it is highly developed activity based on scientific methods. Depending upon the nature of the grasslands, kinds of animals feeding on those grasses also vary. In comparatively rainier parts cattle rearing is more important. Low rainfall areas with short grasses are suitable for sheep. In areas with still lower rainfall goats and camels are reared.

There is a vast difference in the life styles and standards of living of the people engaged in animal rearing in different parts of the world. We will now discuss the nomadic herding and the commercial grazing as well as the life of people engaged in these activities

Nomadic Herding : (Pastoral Nomadism)

Nomadic herding is a subsistence economic activity. It is found in three regions of the world. The first region extends from 5° south latitude to 50° north latitude encompassing the whole of Sahara, coastal areas of east Africa, Iraq, Iran, Afghanistan and dry lands of China and Mongolia covering an area of about 5,600 kilometres.

The second region is located on the southern boundary of the tundra in Eurasia. The third region is found in south-west Africa and western part of Malagasy. The chief characteristic of nomadic herding is the dependence of animals entirely on natural vegetation. Herders neither grow fodder crops nor grass. They wander from one place to another in search of fodder and water. In some parts of the world, their migration is seasonal and it is known as *transhumance*. In tundra region grazers migrate from south to northern mountains in summer and from north to southern coniferous forest belt in winter. In India, the nomadic grazers of Jammu and Kashmir and Himachal Pradesh migrate from the plains to the mountains in summers and from the

mountains to the plains in winter.

Nomadic herders depend on the animal products for most of their necessities. Besides consuming these products directly they exchange these products for obtaining other goods. They generally rear sheep, goats, camels and yaks. The tungus in eastern Siberia rear reindeers. In certain areas cattle are the reared animals. For example, the Gujars of Jammu and Kashmir rear cattle but the Bakerwals rear mainly goats and sheep.

The regions of nomadic herding present harsh environmental conditions. These areas are either too hot and dry or too cold. Grasses are scanty. The shrubs and bushes are also scattered. The density of grasses and other vegetation varies with the change in weather conditions. Thus the carrying capacity per unit area of these grasslands is low. The social status of the nomadic herder depends upon the number of cattle heads. Therefore, each herder tries to enlarge the size of his herd and thus the number of animals exceeds the carrying capacity of the grassland. As such the nomadic herding is carried on vast areas.

The nomadic herding in the northern part of Eurasia is different from the nomadic herding of the dry areas. Vegetation is very small due to extreme cold. In tundra region only mosses and lichens are available for fodder. Hence the animals have to survive on the scanty vegetation. The economy and life style of the nomadic herder has changed in recent decades. There has been extensive expansion of agriculture in the temperate grasslands, particularly in South America, Soviet Union and Australia. Attempts are also being made to get the nomadic herders settled permanently. In Soviet Union for example, extensive irrigation facilities have been introduced in Kirghiz, Kazakh and Uzbek Republics for cotton cultivation. In some areas these people are also being employed in industries. Thus the number of nomadic herders is declining. Different states of India have also been trying to get such people settled. As a result of these efforts the area of their operation will also shrink.

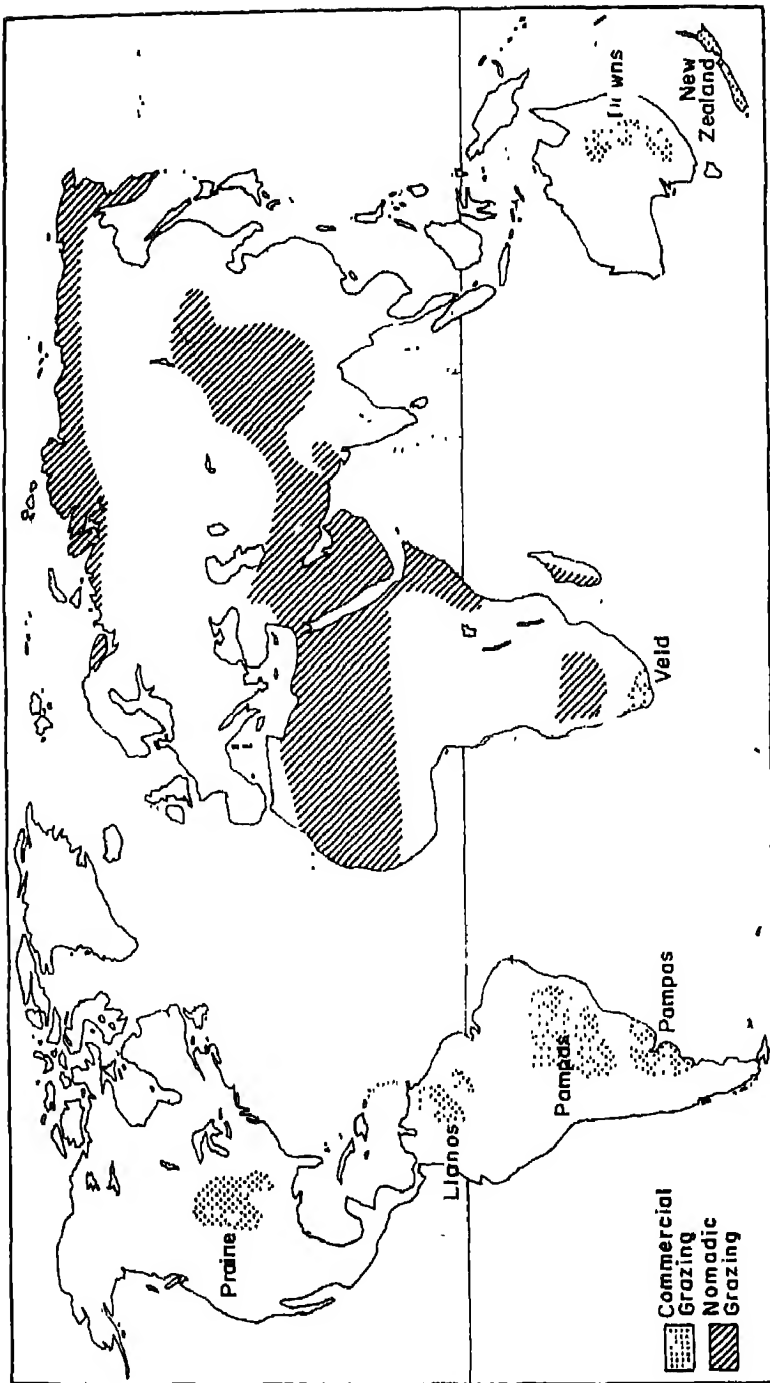


FIG. 3.2 World—major grazing areas

The nomadic herders of east Africa-the Masai.

The plateau of eastern Africa is a vast grassland interspersed with scattered umbrella shaped acacia trees. This plateau is located very close to the equator but the climate of the region has been modified due to its height. The general elevation of the plateau is about 1200 to 1500 metres above sea-level and therefore, temperature never increases beyond 23° celcius. Rainfall varies between 100 and 150 cms. This area is very rich in wild life e.g. lions, tigers, rhinos, elephants. zebra and giraffe are found in large numbers.

This extensive plateau extending from the lake Victoria to the sea coast is originally the abode of the Masais. The moderate climate of the plateau attracted the British and other settlers. In 1902, the British delimited an area of 40,000 sq km and declared it a Masai tribal area and thus restricted their area of herding. This area now lies partly in Kenya and partly in Tanzania.

It is a general belief that Masais migrated to this region from outside during the 18th century. Masais are generally tall and hefty and look different from other tribes living around the Masai territory. The main occupation of Masais is animal herding. They keep large herds of cattle and move from one place to another in search of fodder for these animals.

They do not live in permanent settlements. They construct temporary huts. They are made of grass, and kept on a frame which is about 1.5 metres high. From outside the hut is plastered with cowdung. Except for the entry door, it is closed from all sides. Huts are arranged in close proximity with each other in a circle. They are enclosed by thorny bushes. Animals are kept within the circular enclosure. Outermost hedge protects them from wild animals.

Their life style has made them brave and fearless. They exchange the animal products for maize, bajra etc in the market. Their standard of living is still very low.

The wealth of Masais are their cattle. Masais

are now familiar with money as well as markets. The Kenyan government has been making efforts to settle them permanently. They have also been provided with the health and educational facilities.

Commercial Animal Grazing

The main objective of commercial grazing is to earn money by selling various animal products e.g. milk, meat, wool, hides and skins. The animals are reared on extensive grasslands with modern scientific methods.

In fact, animals are reared on a commercial scale in five regions of the world. They are: The vast prairies extending from north to south in western Canada, western United States of America and central Mexico; area extending from a small part of Venezuela and plateau of Brazil to the southern boundary of Argentina, veldt region of South Africa; temperate grasslands of Australia and New Zealand; and the vast area lying east of the Caspian Sea and north of the Aral Sea.

Cattle rearing is more important under commercial grazing though in some regions like western Europe, Mediterranean regions, Australia and New Zealand, sheep rearing is very important. Besides these regions, sheep are also reared in India and China. However due to high density of population and low man-land ratio commercial grazing on a large scale is not possible in these two countries.

Commercial grazing is organised on a scientific basis and great emphasis is laid on breeding, genetic improvement, disease control and health care of the animals. Large ranches extending over hundreds of kilometres have been enclosed for grazing. These ranches have been divided into different parcels with barbed wires. These parcels are opened for grazing one after the other so that there is time for the regeneration of the depleted grasses. This practice prevents the chances of overgrazing. The animals are kept in sheds during the night. Though the

animals depend primarily on natural grass, fodder is arranged whenever grass becomes scarce. The number of animals is restricted according to the carrying capacity of the pastures in order to avoid overgrazing. This type of large scale livestock rearing is typical in developed economies. It has a permanent economic base. Thus, the commercial grazing differs in many respects from the nomadic herding.

Dairy Farming in New Zealand

New Zealand is one of the foremost milk producing countries. Cold and humid climate and low undulating plains are suitable for the luxuriant growth of nutritious grasses. Besides good pasture lands, the fodder crops are also extensively grown. Instead of large ranches, there are small farms in New Zealand. They are managed scientifically. Breeding of animals, health care, disease control and milching, every thing is done following efficient scientific techniques. The government has established several research centres. Means of transport have been developed so that milk and other milk products are sent to the

market and processing centres immediately. Refrigeration has facilitated the transportation of milk products upto long distances.

The cooperative societies have played an important role in the development of dairy farming in New Zealand. Milk products are marketed through these cooperatives. The quality of the products is guaranteed by the government as it is responsible for quality control.

Geographically New Zealand is located far away from the market for milk products. Hence it is difficult to export milk. That is why milk is converted into high-value produce such as butter, cheese and powder milk. The main market of the milk products of New Zealand are the European industrial countries where the demand as well as purchasing power is higher.

The Taranaki plain in northern Island of New Zealand has the highest density of milch cows in the world. The people have attained specialised skill in dairying through their long experience. The climate of the region has ensured perennial growth of grasses making it possible to graze the animals throughout the year.

EXERCISES

Review Questions

1. Answer the following questions briefly:
 - (i) Describe the main characteristics of the natural vegetation of tropical grasslands
 - (ii) Why are the temperate grasslands more suitable for livestock rearing?
 - (iii) Discuss the main characteristics of nomadic herding.
 - (iv) Write a short note on the life of masais.
 - (v) How is the commercial grazing different from the nomadic herding?
 - (vi) Write a note on dairy farming in New Zealand.
2. Distinguish between :
 - (i) Tropical and temperate grasslands
 - (ii) Steppes and prairies.
3. Give reasons:
 - (i) Trees are scanty in tropical grasslands.
 - (ii) The carrying capacity of tropical grasslands is low.
 - (iii) Ranches are divided into different parcels.
 - (iv) New Zealand exports more milk products than milk.

Cartographic work

4. Show the following on the world map.

- (i) Nomadic herding areas in the tundra
- (ii) The homeland of masais.
- (iii) Commercial grazing area of the prairies.
- (iv) Veldt.

CHAPTER 4

Non-renewable Resources: Minerals

MINERALS consist of one or more elements. They have specific chemical composition. They are recognised by their physical and chemical properties. Minerals are important constituents in the bodies of human beings, animals and vegetation. All rocks found on the surface of the earth are also composed of minerals. Most of the minerals are inorganic or abiotic but coal and mineral oil are organic resources.

Importance of minerals in human civilisation is reflected from the fact that the stages in the history of economic development are referred to as stone age, copper age, bronze age and iron age. Minerals have significantly contributed in the modern industrial development of the world.

Chief characteristics of minerals are as the following. They are unevenly distributed over the earth's surface. Most of these minerals are exhaustible and they are generated only through geological processes after millions of years. The quantity and quality of minerals is inversely correlated. None of the countries in the world are self sufficient in all minerals. Hence the international competition for minerals between the haves and have nots.

CLASSIFICATION OF MINERALS

Minerals are divided into two broad groups: metallic and non-metallic. *Metallic minerals* are those from which we get metals such as iron,

copper, gold and lead. These minerals are basically found in the form of ores from nature. These ores also contain several impurities. Therefore, metals have to be separated from these compounds. In some ores, two or more minerals are found together. e.g. zinc and silver. Non-metallic minerals include a number of minerals e.g. nitrate, sulphur, potash, salts, coal and petroleum. Coal and petroleum are used as fuel, hence they are also known as *mineral fuel*.

We will now discuss some of the metallic mineral resources.

Iron Ore

Iron ore, as you know, is a metallic mineral. It is not found in a pure form in nature but is available as ores or compound. There are different types of iron ores; haematite, magnetite, limonite and siderite. However, there is a large variation in the metallic content of these ores. If the metallic content of an ore is less than 30 per cent, its mining is costly. The purer the iron ore, greater is its economic importance.

Iron is the symbol of modern civilisation. It is used in almost all types of machines, machine tools, construction of buildings and factories and various means of transport e.g. in making rails, motor cars and ships etc. In comparison to other metals, it is the most widely used metal in the world mainly because of its certain qualities. It can be converted into different forms such as cast

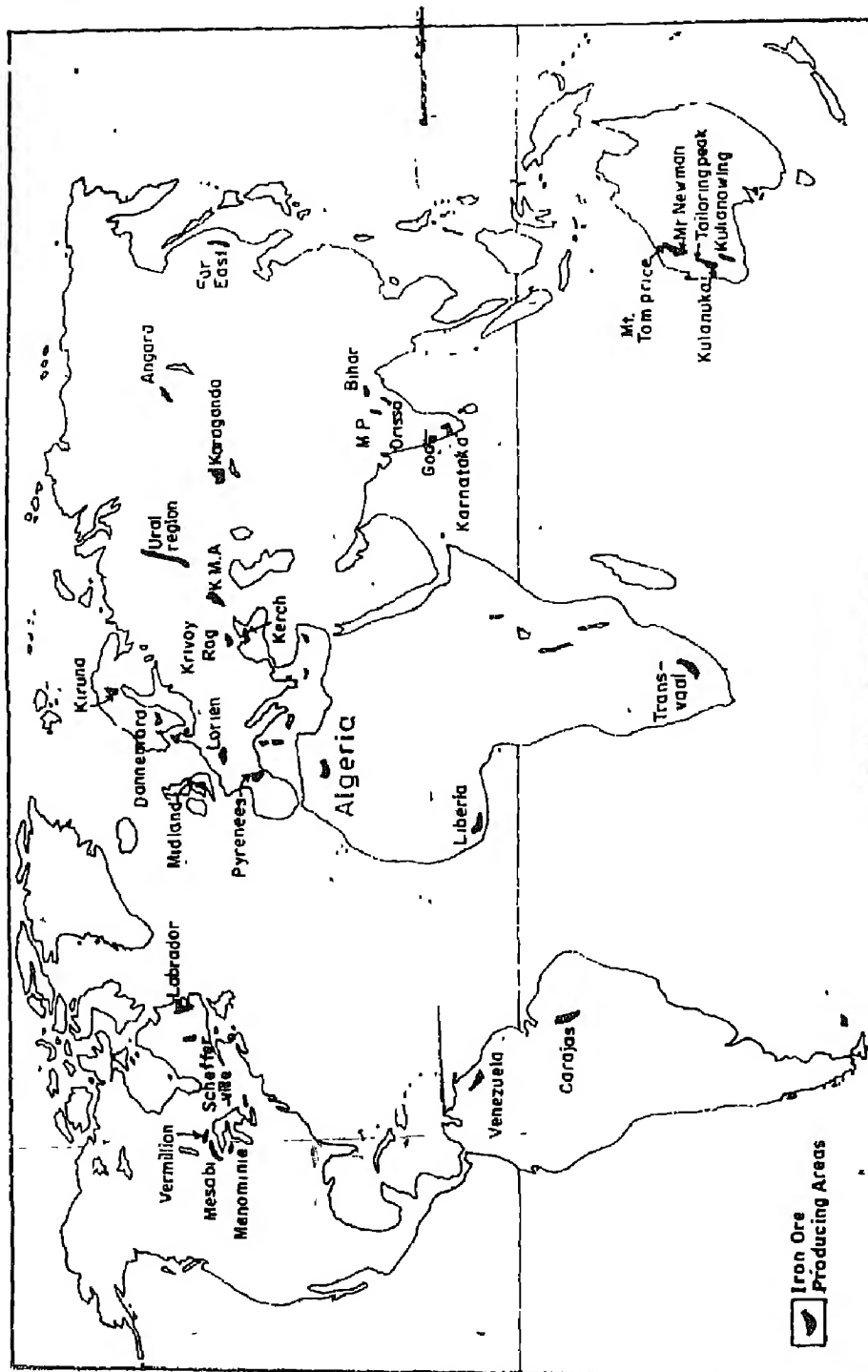


FIG 4 1(a) World distribution of iron-ore

iron, sheets, magnetic iron and steel.

Iron ore is mixed with coke and limestone and heated in a blast furnace. This process is known as 'smelting'. In this process, a number of impurities of the ore are removed and pig iron is obtained. It can also be used as cast-iron. The wrought iron is obtained after removing the carbon from cast iron through further heating.

Besides, hardness, strength and durability are other major characteristics of iron. It is malleable and can be hammered into a sheet or wire. It has magnetic qualities also. Different kinds of metals such as manganese, nickel, vanadium and chromium are mixed in various proportions with iron to prepare different alloys. Depending upon the proportion of different metals a variety of steels having different properties can be produced. It is because of the economic importance of iron that the per capita consumption of iron in a country is taken as an indicator of its level of economic development.

Distribution of Iron ore

Iron ore is distributed unevenly in the world. Its major producers are Soviet Union, China, Australia, Brazil, United States of America and India.

Soviet Union is the largest producer of iron ore. It is estimated that 40 per cent of the proved reserves of iron ore is found in Soviet Union. Its probable iron ore reserve is estimated to be about 9,500 to 10,000 crore tonnes. About 50 per cent of the total iron ore extracted in Soviet Union is obtained from its European part particularly from Krivoy Rog region. Good quality ore with higher iron content is found in Krivoy Rog, Kursk Magnetic Anomaly (KMA) and Kerch peninsula. Western Azerbaijan has also reserves of good quality ore. Another important iron producing area of Soviet Union is the Ural region. Reserves of Sverdlovsk in the northern Ural, Nizhny Tagil in the central and Magni Togorsk in the southern Ural are very important. Iron ore reserves

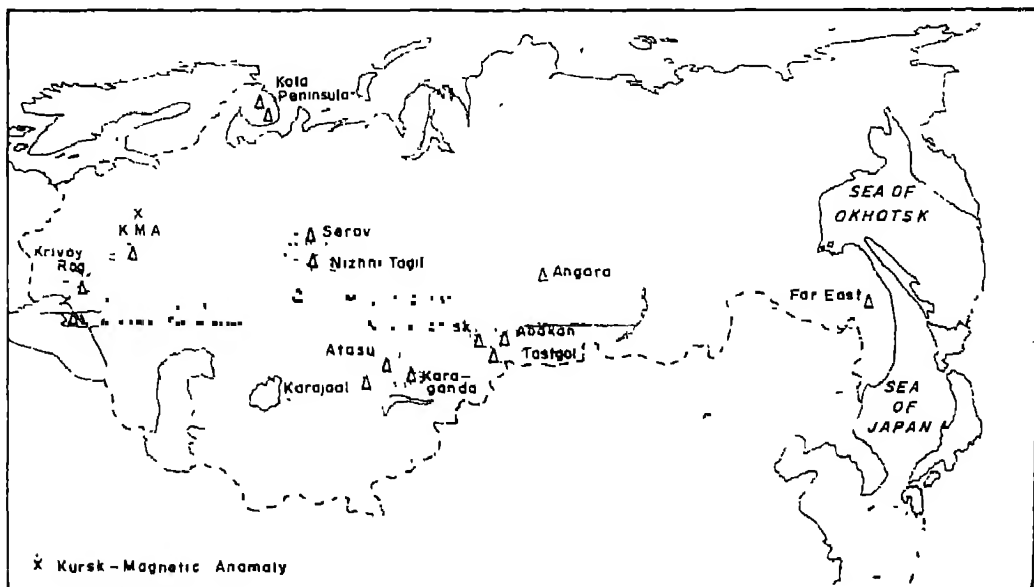


FIG 4.2 USSR—Major iron-ore mining areas

have been found in Kuzbas region also. The known reserves in eastern Siberia are those of Krasnoyarsk and Angara-Ilim. Important reserves have been located at Kutnai in Kazakhstan.

Traditional areas of iron ore mining in United States of America are the Great Lakes region and Alabama State. The major iron ore mines of Great Lakes region are Mesabi, Marquette, Menominee, Vermillion, Gogebic and Cuyuna. Mesabi is the most important mine and contributes about 70 per cent of the total iron ore production of the country.

In Alabama, Red mountains and Birmingham, located in the southern parts of Appalachian mountains, are other important iron ore mining areas. The iron content of the ores of this area is comparatively less than those of the Great Lakes region. Steep Rock on the Canadian side of the Lake Superior was traditionally an impor-

tant iron ore mining area of Canada but now this activity has shifted towards the boundaries of Quebec and Labrador. Important mining centres are Wright, Sept Isles and Schefferville

There are large iron ore reserves in the Shenyang (Mukden) region of Manchuria in China. Wuhan and Tai-yeh are the major iron ore mining centres in the Yangtze valley. Other important mining centres are Hainan island, Hnan, Shandong peninsula, Hangzhon and Cha-Har

In Europe, the best quality iron is found in Sweden. The important mines in northern Sweden are Kiruna and Gallivare. Dennemora is an important mining centre in southern Sweden. Sweden does not have coal resources for smelting the ore, therefore, most of it is exported. Another important iron ore reserve is Lorraine in France. It is the second important iron ore area in Europe after Kursk Magnetic Anomaly in

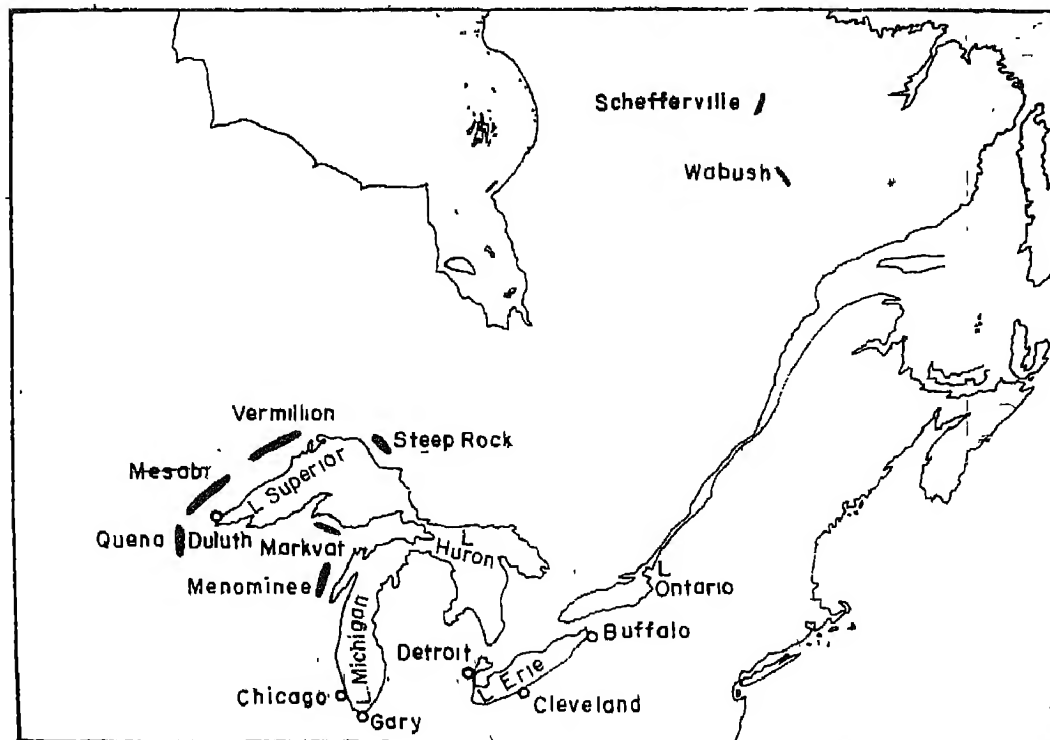


FIG. 43 Major iron ore mining areas of Canada and U.S.

Ukraine. The iron ore in Lorraine has lime mixed with it. Normandy and Pyreneese regions are other important areas in France. Salzgitter and Seigen are important iron ore mining centres in the Federal Republic of Germany. In Spain, iron ore is extracted from Bilbao mines. The iron ore is mined at Cleveland, Midland and Scotland regions of United Kingdom. For meeting the local demand the iron ore is also imported from Sweden, Spain, Canada and Liberia.

In Africa, Liberia, South Africa and Algeria are the important iron ore producers. The iron content in the ores of Liberia is 62 per cent, while in South Africa, it ranges between 62 and 65 per cent. Besides, Algeria, Morocco and Tunisia are the other iron ore producing countries in northern Africa. Since the iron and steel industry in Africa has not yet fully developed, hence, most of the ore is exported to other countries.

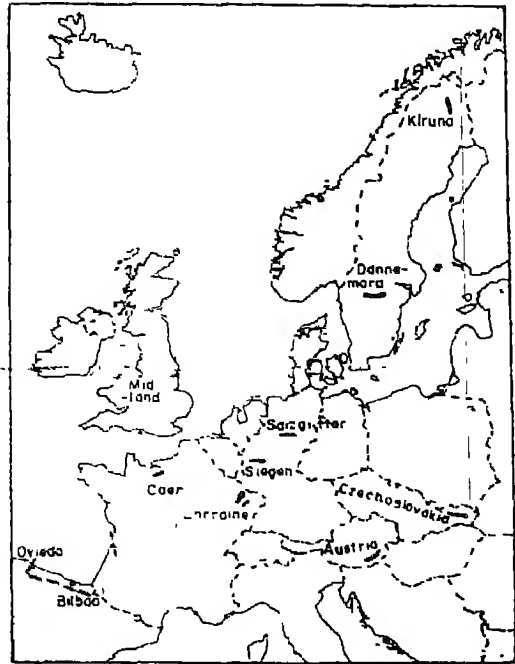


FIG 4 4 Europe—Major iron-ore mining areas

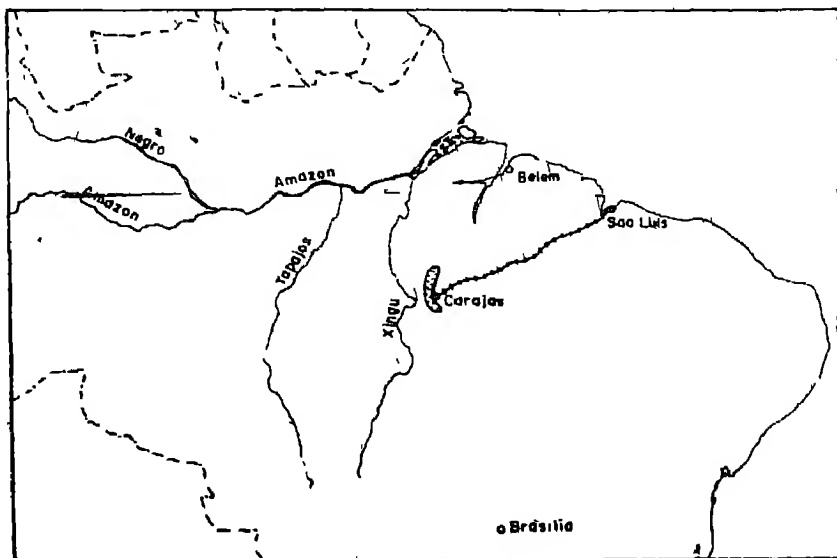


FIG. 4 5 Brazil—iron-ore mining areas

Australia is an important producer and exporter of iron ore. Its reserves are found in western Australia. Pilbara region is the largest producer of iron ore in Australia. Mt. Goldsworthy, Mt. Tom Price, Mt. Newman, Tailoring Peak, Koolanooka, Koolyanobing are important iron ore mining areas. Some iron ore is also found in Queensland, New South Wales and Tasmania.

India is also an important iron-ore producer country. The major states producing iron ore are Orissa, Bihar and Madhya Pradesh. Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu are minor producers. The concentration of iron ore production is found in Mayurbhanj, Keonjhar and Sundargarh districts of Orissa. Singhbhum district of Bihar is rich in iron ore reserves. In Madhya Pradesh it is found in Bailadila ranges and in Durg district. Chikmagalur, Chitradurg Tumkur and Bellary districts are important producers of iron ore in Karnataka.

In South America, the largest reserves of iron ore are found in Brazil. The quality of the ore is also very good as the iron content is more than 68 per cent. Most of these reserves are found at Carajar in Para district. Iron ore reserves are also found in the lower Orinoco valley in Venezuela and La Sarena in Chile.

Production of Iron Ore

The pattern of iron ore production has been presented in the figure 4.1(b). It clearly shows the trends of the fluctuations in the production of iron ore in the world. There has been a change in the relative position of countries in the production of iron ore. In 1980, only eight countries contributed 93.2 per cent of the total iron ore production of the world but their contribution decreased to 84.3 per cent in 1986. Look at the diagram and name the countries and where the

iron ore production has decreased? What has been the situation in India? Which of the countries did not register significant change in the production of iron ore? Soviet Union has been the largest iron ore producer both in 1980 as well as in 1986.

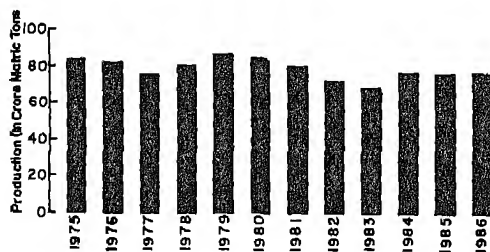


FIG 4.1(b) World—Production of iron-ore 1985-86

Copper,

Copper as a metal was only next to iron in importance until recently. Now it has been displaced by aluminium. Copper has been used by human beings since ancient times. It is used largely in electrical industry because of its quality of electrical conductivity. Its increasing demand due to the expansion of electrical industry in the twentieth century, led to the development of such a technology which made it possible to extract copper from low grade ores.

Copper has been proved useful due to its qualities of malleability and ductility. Besides these, it is corrosion resistant and can be mixed with other metals to make copper alloys, e.g. copper and tin ore mixed to make bronze; and copper and zinc make brass.

Copper occurs in pure state as well as in the form of compounds. The main copper ores are cuprite, malachite, chalcocite and covellite.

Distribution of Copper

There has been no change in the pattern of copper distribution in the world during recent decade. Chile, United States of America, Soviet Union,

Canada, Zaire, Zambia, Poland and Peru continue to be the major copper producing countries.

The major copper mines of Chile are Chuquibambilla, El-Teniente, Potrerillos and Braduc. Peru is another country in South America where copper mining is important.

The copper mining area in United States of America is located in the western part from Canadian border in the north to Mexican border in the south. Arizona is the largest copper pro-

world. Of these Zaire and Zambia together contribute about 12.0 percent.

In Canada, copper is mined from Sudbury in Ontario and Noranda in Quebec.

The copper mining region in Soviet Union extends over a large area. The Ural region has been a traditional copper mining area but now production has gone down. A very important copper mining complex has developed in Kazak-

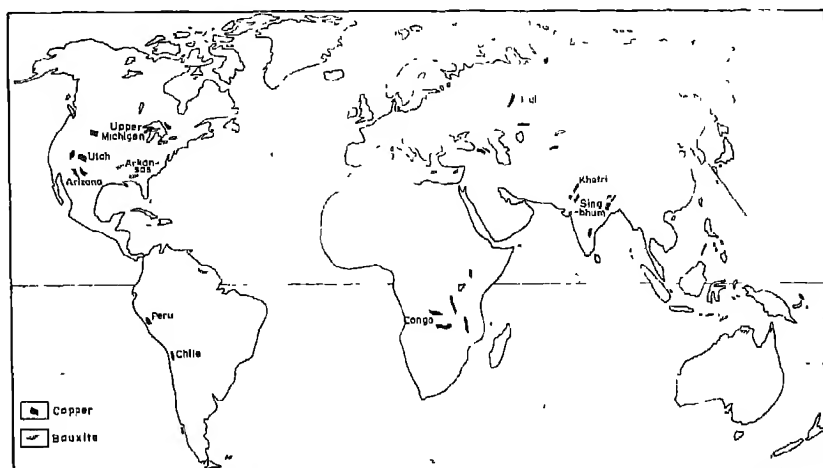


FIG 4.6 World—Distribution of copper-ore and bauxite

ducing state where the important mines are located near Tucson e.g. Morenci, Globe, and Casa-Grande. The largest mine is Bingham, located in Utah. In Bingham, copper is found very close to the surface hence open pit mining is cheaper. The other important mining area is near Butte in Montana state.

Amongst the developing countries Zaire and Zambia in Africa are major copper producing countries. South Africa also has some copper mines. Katanga district is the main copper region of Zaire. African countries contribute about 15.5 per cent of the total copper production in the

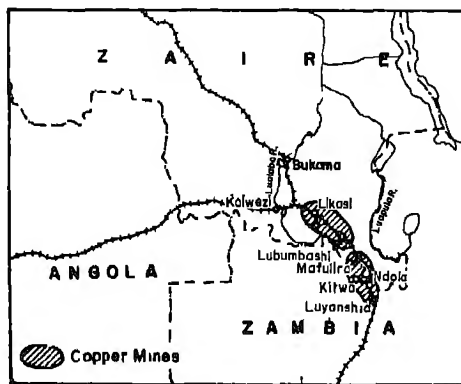


FIG 4.7 Copper mining areas of Zaire—Zambia

hasan, Copper is also mined in southern Georgian and Armenian SSRs between the Black Sea and the Caspian Sea. The south western part of Balkash lake and Norlusk in the north are other copper mining areas.

Apart from these major producers China, Japan, Indonesia, Australia, Poland, Yugoslavia, Spain and India also produce some copper. In India, copper is mined in Singhbhum and Hazaribagh districts of Bihar, and in Khetri district of Rajasthan. An important copper reserve has been found in Aguncha-Rampura area of Bhilwara district of Rajasthan during eighties.

Production of Copper

The trends in copper production can be observed in the given diagram. What has been the pattern between 1980-86? It is clear that United States of America occupied the first place amongst the copper producing countries in 1980. It contributed about 14.16 per cent of the total copper production in the world but in 1982, Chile occupied the first place. Chile, Soviet Union, United States of America and Canada together contribute 53 per cent of the total copper production of the world. India's contribution in the copper production is negligible. Besides Chile, Peru is another significant producer in South America.

Bauxite

Bauxite is the ore of aluminium. Aluminium is a light and versatile metal. As such it has wide industrial uses such as in aeroplane industry, machine tools, electricals and utensil industry etc. It is also being used in construction, packing material and furniture industry. Aluminium is an energy intensive industry because aluminium is extracted from the ore using electrolysis melting process.

Distribution and Production of Bauxite

Australia occupies the first place in bauxite mining in the world. Guinea (Africa), Jamaica

and Brazil are other leading producers. Bauxite is mostly mined in tropical regions but aluminium is manufactured in developed countries where cheap electric energy is abundantly available.

In Australia, bauxite is mined from Weipa lying east of the Gulf of Carpentaria and north eastern Arnhem land on the western side of this gulf. Surinam and Yugoslavia also contribute significantly to the bauxite production in the world.

In USA, bauxite is extracted mainly from Arkansas. A small amount is mined from Georgia and Alabama. Production of bauxite is insufficient to meet the demand and, therefore, it is imported from Jamaica, Surinam and Dominican Republic.

Bauxite mining is not important in Soviet Union and the aluminium industry is dependent upon imported bauxite from Guinea, Yugoslavia, Greece, Hungary and Caribbean areas. France also has limited bauxite mining.

China, Malaysia, Indonesia, Turkey and India are leading bauxite producing countries in Asia. In India, Bihar, Madhya Pradesh, Maharashtra, Tamil Nadu and Karnataka are major bauxite producing states.

The production of bauxite has decreased after 1980. The trends in the production can be discussed with the help of data given in the Exercise of this chapter. What proportion of bauxite production is contributed by Australia, Guinea and Jamaica taken together? Compare figs drawn by you and tell changes which have occurred in the relative positions of producer countries.

Six international corporations control about 60 per cent of the bauxite production in the world. These corporations have been established in developed countries e.g. Aluminium Company of Canada (ALCAN) and Aluminium Corporation of America (ALCOA). International Bauxite Association was formed in 1974.

With the increasing demand for aluminium, there are possibilities of developing bauxite mining.

EXERCISES

Review Questions

1. Answer the following questions briefly:
 - (i) Discuss the main characteristics of minerals and classify them.
 - (ii) Write a detailed note on the distribution and production of iron ore.
 - (iii) Discuss the main characteristics of copper and describe the regional pattern of its mining in the world.
 - (iv) What is the use of bauxite? Write a note on its production trends.

Cartographic Work

2. Represent the following data with the help of bar diagram and discuss the trends in the production of copper.

Copper production in the world

<i>Year</i>	<i>Production (in lakh metric tonnes)</i>	<i>Year</i>	<i>Production (in lakh metric tonnes)</i>
1980	83.7	1984	85.6
1981	87.3	1985	84.6
1982	84.8	1986	84.6
1983	85.0		

3. Contributions of different countries to the total copper production of the world have been presented in the following table. Represent these figures with the help of pie-diagram and give the proportion of copper production contributed by the North American and African countries.

Major Copper Producing Countries of the World

<i>Country</i>	<i>Production (in '000 metric tonnes)</i>
Chile	1391
Soviet Union	1180
United States of America	1150
Canada	744
Zambia	537
Zaire	506

<i>Country</i>	<i>Production (in '000 metric tonnes)</i>
Poland	435
Peru	398
World	8457

4. Represent the following data by comparative bar diagram and discuss the changes in position of different bauxite producing countries after 1980.

Bauxite production in the world

<i>Country</i>	<i>1980 Production (in '000 metric tonnes)</i>	<i>Country</i>	<i>1983 Production (in '000 metric tonnes)</i>
Australia	27,629	Australia	22,865
Guinea	13,911	Guinea	12,986
Jamaica	12,049	Jamaica	7,725
Brazil	6,688	Brazil	7,199
Surinam	4,893	Yugoslavia	3,500
Greece	3,259	Hungary	2,917
Yugoslavia	3,138	Surinam	2,793
Hungary	2,950	Greece	2,435
France	1,921	India	1,976
United States of America	1,869	Guyana	1,791
World	93,193	World	77,618

5. Show the copper mining areas on the map of the world.
6. On the sketch map of the world show the iron ore producing regions of United States of America and Soviet Union.
7. Show the iron ore and bauxite mining areas on the map of Australia.

CHAPTER 5

Energy Resources

ENERGY is an important factor in the development of an economy. The demand for energy has increased with the economic development in the world. Some of the energy resources are exhaustible or non-renewable, e.g. coal and mineral oil but many are renewable, e.g. , water and solar energy. Potential of water energy is more in those regions where water discharge of the rivers is high, rainfall is heavy and running water is available throughout the year. Solar energy is more dependable and universally available. Other non-conventional energy resources are biogas, wind, tidal and geothermal energy. The increasing demand of energy and the energy crisis of 1973 in the world have given impetus to research and development of non-conventional sources of energy.

Coal

Coal has been the basis of industrial revolution. Its importance as source of energy has declined after the introduction of mineral oil and natural gas. The fluctuations in the utilisation of coal, during last 200 years, can be divided into phases. During first phase, coal became the major source of energy for industries and railway transport. The iron and steel industry became the major user of coal for energy during second phase. The third phase started after the second world war when the demand for coal increased due to its use as

a source of energy.

Coal is found in seams in sedimentary rocks. Its major quality is its combustibility and volatility. Most of the coal has been formed during the carboniferous period of geological history owing to the submergence of natural vegetation.

The coal can be divided into three types on the basis of its carbon content

Anthracite is very hard, shiny and free of impurities. It contains about 90 percent of carbon. It gives off little smoke and leaves little ash after being burnt. There are very limited reserves of this type of coal.

Bituminous coal contains 70 to 90 percent of carbon. It is black and shiny. It gives smoky flame and leaves behind much ash. These coals are known as bituminous because they yield tar (bitumen) when heated. It is found in greater quantity as compared to other types.

The carbon content in lignite or brown coal is 45 to 70 percent. Its colour is usually brown. It burns with high smoky flames. It is of much more recent origin than anthracite and bituminous coals and, therefore, contains higher proportion of vegetal matter.

Though peat is also known as coal but in fact it is not so. It represents the first stage in the formation of coal from vegetation. It is light brown in colour with high humidity content. Being the most inferior coal, it does not have any industrial importance.

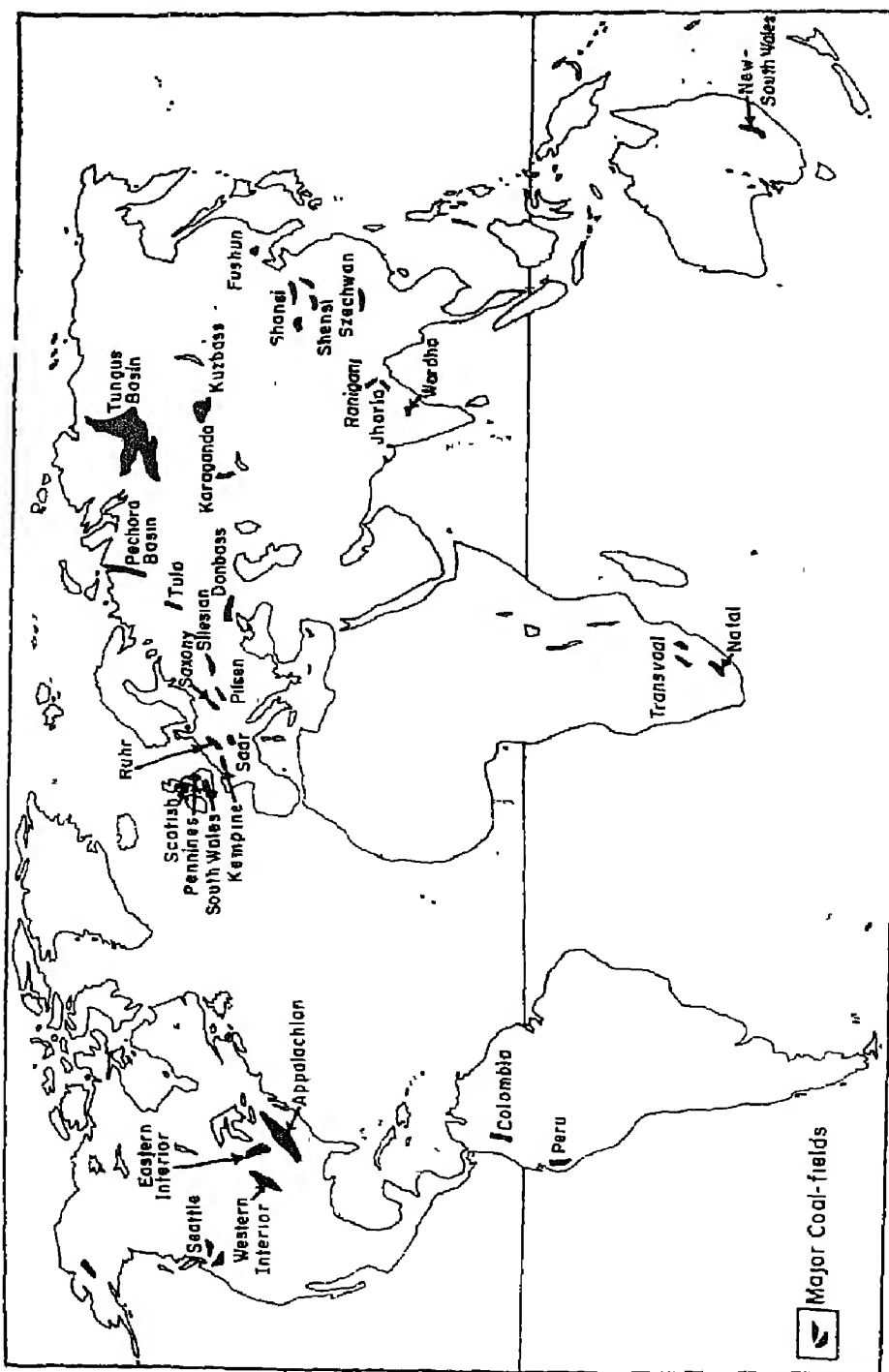


FIG. 5.1 World—Distribution of major coal-fields

World Distribution and Production of Coal

Major producers of coal in the world are China, United States of America, Soviet Union, Poland, South Africa, India, Australia, Federal Republic of Germany, Canada and United Kingdom.

According to 1986 production figures, China is the leading coal producer of the world. Coal mining areas in China are found in the north. Eight provinces in China produce coal. They are Datong (Totung) in Shansi province; Huo-Lin-He (Hu-lin-Ho) in Inner Mongolia, Huainan and Huaibei in Anhui; YanZhou in Shandong (Shan-tung) peninsula; Xuzhou (Suchou) in Jiangsu (Kiangsu), Liupanshan in Guizhou (Kweichow); Pingdingshan in Henan; and Kailuan in Hebei province.

The United States of America is the second largest producer of coal. Due to uncertainties after the Second War, the coal mining industry suffered. Main reasons were the development of nuclear power, subsidised pricing of oil and natural gas and the environmental laws pertaining to mining and use of coal. Since 1973 the importance of coal has been restored to some extent due to price hike of oil and the embargo imposed by some Arab nations on oil supply.

The coal mining areas of United States lie in the eastern part. The Appalachian coal region extends from north western Pennsylvania to Alabama. Kentucky and western Virginia are the major coal producing states in this region. Illinois, Utah, Montana, Wyoming, Colorado, Washington, Arizona and New Mexico are other important coal producing states.

Donetsk Basin is the major coal producing region in the USSR. The other important area is Kuznetsk basin (Kuzbas). The coal seams here lie close to the surface making it possible to adopt open-pit mining. Karaganda is the third region where coal is also mined in Kansk-Achinsk basin of southern Siberia and Ekibastuz basin, which is located close to Karaganda coalfields.

The coal region of Europe extends from north

eastern France to Poland. Franco-Belgian coalfields, Campine-Limburg coalfields, the Ruhr, Saar, Silesia, Saxony and Pilsen coalfields form the major coal belt. Outside this belt, some coal occurs in the United Kingdom, Spain and central plateau of France. The coalfields of United Kingdom are located in Scottish lowlands, Pennine ranges and South Wales.

The major coal region in India extends over West Bengal, Bihar and Orissa. Raniganj, Jharia, Bokaro and Giridih are some of the important mines. Coal is also mined in the Wardha valley in Maharashtra and Sohagpur and Umaria regions of Madhya Pradesh.

Most of the coal mines in Australia are located in New South Wales. Besides this, some coal is mined in Queensland and Western Australia. Africa has very little coal deposits. South Africa is the most important coal producing country here. Its coal mines are located in Transvaal, Natal and Orange-Free State. South America, too, has little coal deposits.

The total coal production has increased from 273 crore metric tonnes in 1980 to 323 crore metric tonnes in 1986, registering an increase of 18.4 percent. The pattern of coal production has been representing in Figure 5.2

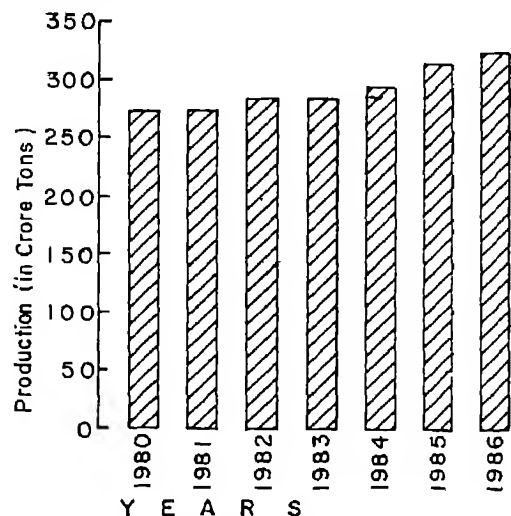


FIG. 5.2 World—Production of coal, 1980-86

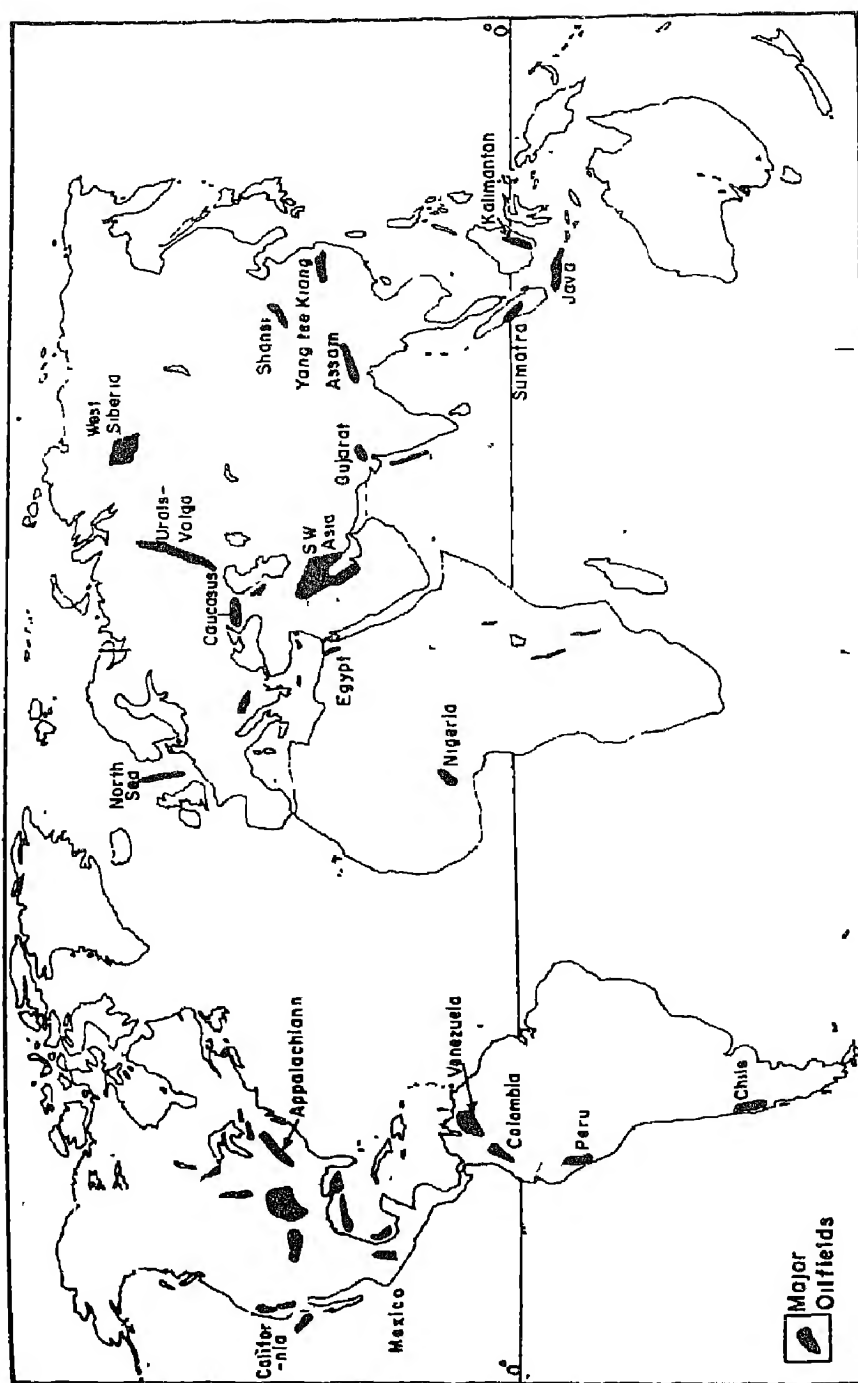


FIG 5.3 World—Distribution of Mineral-Oil

Positions of different coal producing countries have changed. In 1980, the United States of America produced 26.0 percent of the total coal production and occupied the first place in the world. In 1986, China occupied the first place by contributing 27.8 percent of the total coal production and the United States of America moved to the second place. While coal production in India, Poland and Australia has increased, it has relatively decreased in United Kingdom and Federal Republic of Germany.

Mineral Oil

Mineral oil is obtained from those decomposed tiny marine creatures, minute plants and animals which were buried under the sediments some 10 to 20 crore years ago. Oil is generally found in the dome like structures of sedimentary rocks. The possibility of getting oil in igneous and metamorphic rocks is generally ruled out because tremendous heat and pressure involved in the formation of such rocks would destroy any oil if it happened to be there. The mineral oil has great industrial importance in the modern world economy. Per unit weight of oil produces much higher energy than the same weight of coal. Hence it is more efficient and versatile source of energy. It is used in driving the vehicles and locomotives, manufacturing of chemical fertilisers and insecticides, generating power, mechanical energy and as lubricant. Generally mineral oil and natural gas occur together.

Distribution and Production of Mineral Oil

Mineral oil is very unevenly distributed over space like any other mineral. The possibility of its occurrence is generally in the regions of sedimentary rocks but all sedimentary rocks may not have mineral oil. There are six regions in the world, which are rich in mineral oil.

In North America, mineral oil was first drilled in Pennsylvania but later the activity extended towards Texas, Oklahoma and Kansas States.

California, Louisiana and Wyoming are also important oil producing states

Mexico was a major oil producing country in the earlier part of the century but its importance declined later. Venezuela is the leading producer of oil in South America. Peru, Colombia, Argentina and Chile are minor producers.

The Caucasian region has been the traditional oil producing area of Soviet Union. Oil was first drilled from Mykope in northern Caucasus in 1863. In 1871, oil was found at Baku. Later, a third oilfield was discovered at Grozny. Volga basin lying west of Ural became a leading oil producing area in Soviet Union. Oil has also been found in the north of Caspian Sea and Sakhalin Islands. Soviet Union has also explored oil in Ob basin of western Siberia and wells at Tanen have started yielding oil.

Iraq, Saudi Arabia, Kuwait, Iran, United Arab Emirates, Qatar and Bahrain are the main oil producing countries of West Asia. According to the estimates of 1985, 50 per cent of the total reserves of crude oil in the world lies in this region. Oil in West Asia was first drilled in 1909 at Masjid Sulaiman. Anglo-Iranian Oil Company got oil at Gachsaran and Agasari later. Gradually, most of these countries started drilling oil. The Iran-Iraq war during 1980-88, has adversely affected their oil-based economy. Extensive oil reserves in this region have created rivalry amongst the super powers.

The mineral oil resources of Indonesia were developed by Dutch with their capital and technology. Indonesia occupied an important place on the oil map of the world during the second decade of the present century. The main oilfields of Indonesia lie in central Sumatra, Java and Kalimantan. In Republic of Myanmar (Burma) oil is being drilled in Irrawady and Chindwin valleys.

In India oil was first found at Makum in north-east Assam but the drilling of oil was started at Digboi in Lakhimpur district. Dibrugarh, Digboi, Makum, Naharkatiya and Surma

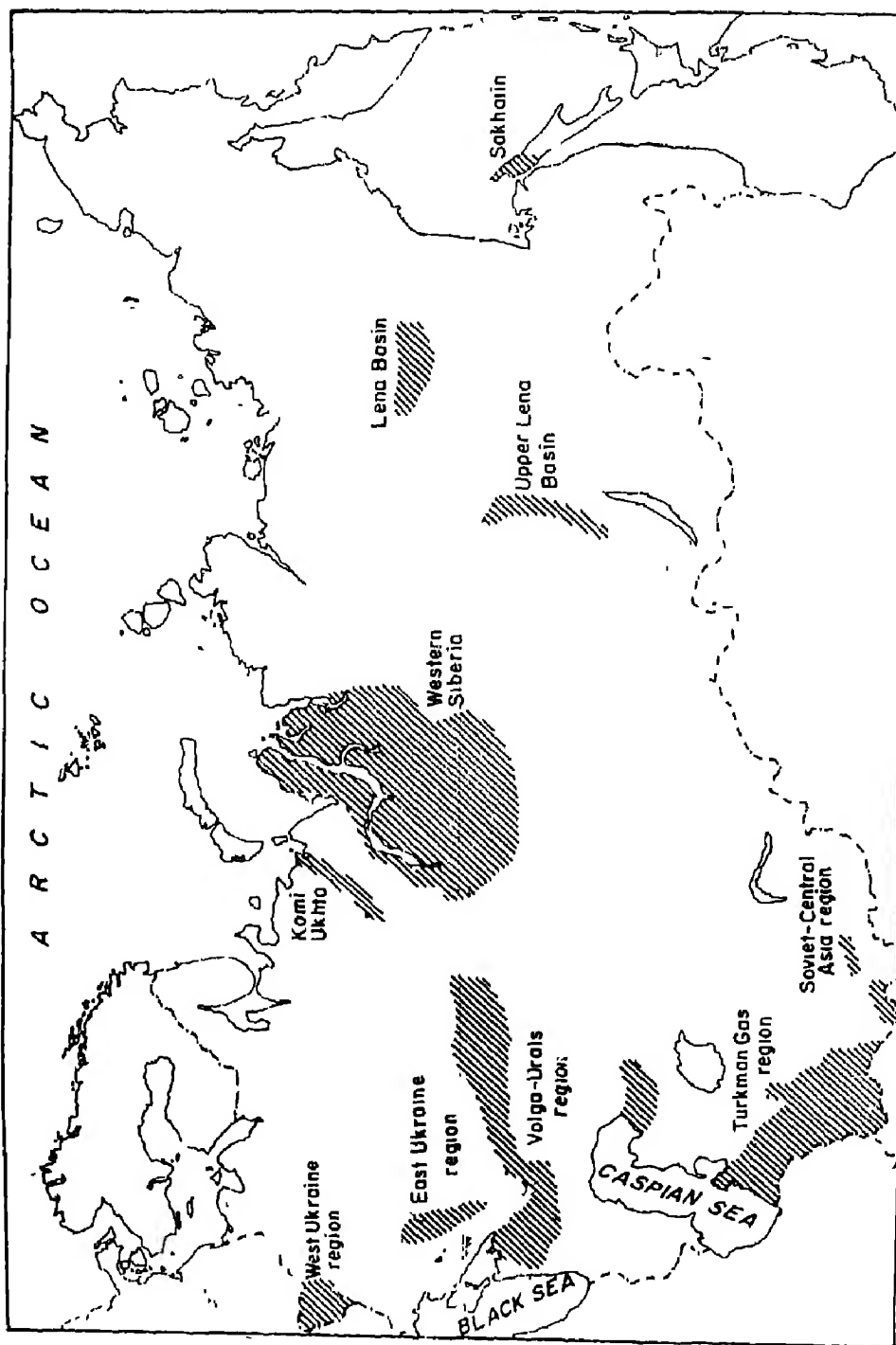


Fig. 5.4 USSR—Major mineral oil fields

valley are the important oil producing areas in the north-east. The other important oilfield lies in Gujarat around Bay of Cambay. Important wells in Gujarat are located in Kalol, Ankleshwar, Mehsana, Kosamba and Dholka.

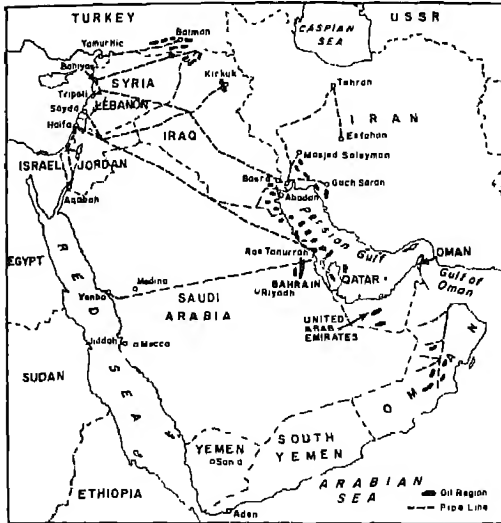


FIG. 5.5 Major oil-fields of Western Asia

An important achievement of India has been the exploration of oil in the Bombay High on the continental shelf off Maharashtra, located at a distance of 167 km north-west of Bombay.

Known oil reserves in Africa are very limited. Estimates in 1985 put it to be about 8 per cent of the total oil reserves of the world. Libya, Nigeria and Egypt are the important oil producing countries of Africa.

In Europe, oil was first found in Rumania but now its production is very little. Large reserves of oil have been found in the North Sea, which are shared by United Kingdom, Norway, Denmark, Federal Republic of Germany and the Netherlands.

Japanese oilfields are located in Hokkaido and Honshu Islands while most of the Chinese oil fields are found in Yangtze valley and Shansui

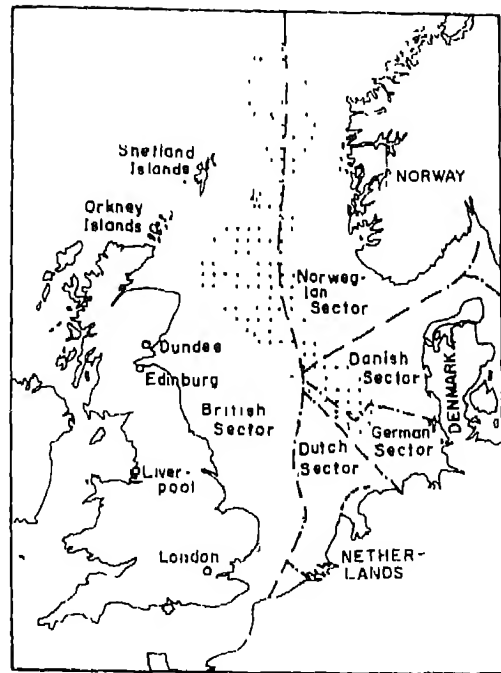


FIG 5.6 North Sea—Mineral-oil producing region

province.

Development of modern means of transport and industries has generated large demand for oil. After the second world war, its production witnessed tremendous increase.

Fig 5.7 represents the trend of oil production from 1980 to 1986. It is clear that the oil production has declined during this period. Examine the diagram carefully and tell the total quantity of oil produced in 1983 and 1985.

In 1986, Soviet Union contributed 22.2 per cent of the total oil production of the world while the contribution of the United States of America has been 15.5 per cent. Saudi Arabia occupied the third place with 9.0 per cent of the total oil production. Consumption of mineral oil is more in developed countries. With industrial development demand for mineral oil is increasing in developing countries also.

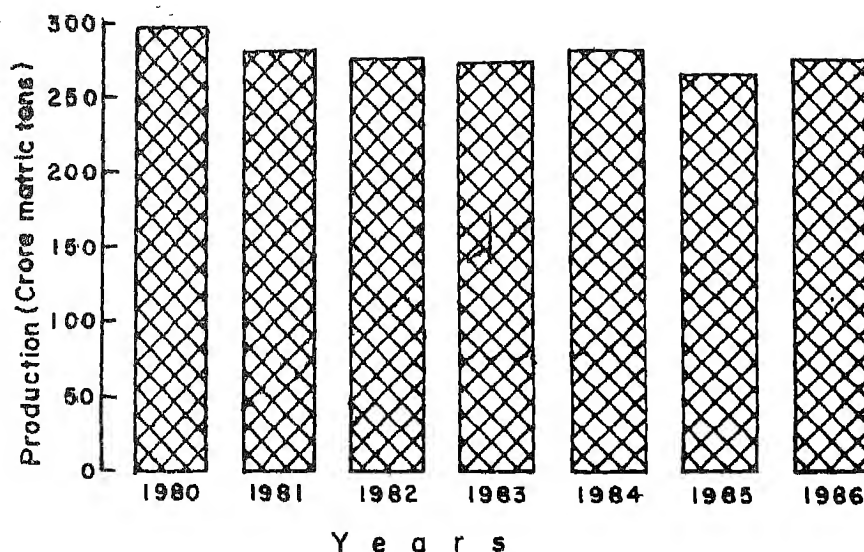


FIG. 5.7 World—Production of crude oil, 1980-86

Uranium

Uranium and thorium are radio-active minerals which have great capacity to generate energy through nuclear fission. Very few minerals yield energy through fission. Only a few countries of the world have the technology of the fission of nuclear minerals. It is a costly technology. It requires careful handling of experimentations otherwise it may lead to catastrophe. The accidental leakage at Chernobyl in USSR is one such example. Besides being destructive to human life and property, such accidents are detrimental to the environment.

There are two primary sources of uranium, pitchblende, which has 50 to 80 per cent uranium content and uraninite, in which uranium content is 65 to 80 per cent.

Distribution and Production of Uranium

Canada and United States of America are the leading uranium producers. Uranium is found near the Uranium city on the northern bank of Lake Atabasca and Port Radium of Lake Great Bear, Colorado plateau of United States of America has rich uranium deposits. Uranium is also

found in South Africa, Australia, Zaire, Malagasy, Czechoslovakia, Federal Republic of Germany, Spain, Sweden and Soviet Union.

The uranium deposits in India are found in Gaya and Singhbhum districts of Bihar, Udaipur and Jajpur districts of Rajasthan, Nellore district of Andhra Pradesh and Palghat district of Kerala.

Several countries do not provide data regarding the production of uranium due to its strategic importance. Most of the available data is neither adequate nor dependable.

Fig 5.9 represents the production of uranium as obtained from the U.N. Statistical Year Book for 1983-84. According to these data, USA contributed 22 per cent of the total uranium production in the world followed by Canada with 19.5 per cent.

Nuclear energy is still in the initial stages of its development. There are two important reasons behind its slow development. Firstly, construction of nuclear power stations are very costly and secondly, a high degree of scientific and technological expertise is required to manage the nuclear energy. As a result nuclear energy has

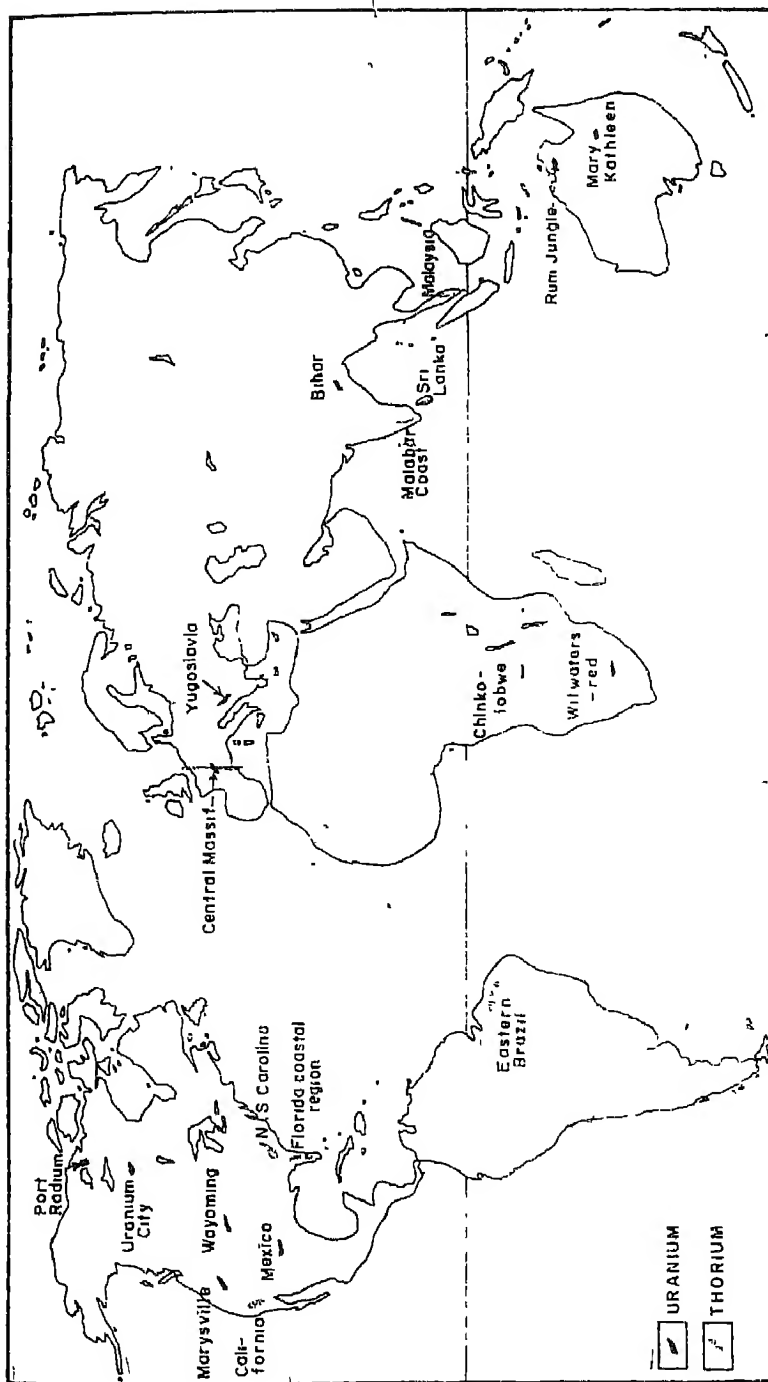


FIG 5 8 World—distribution of uranium and thorium

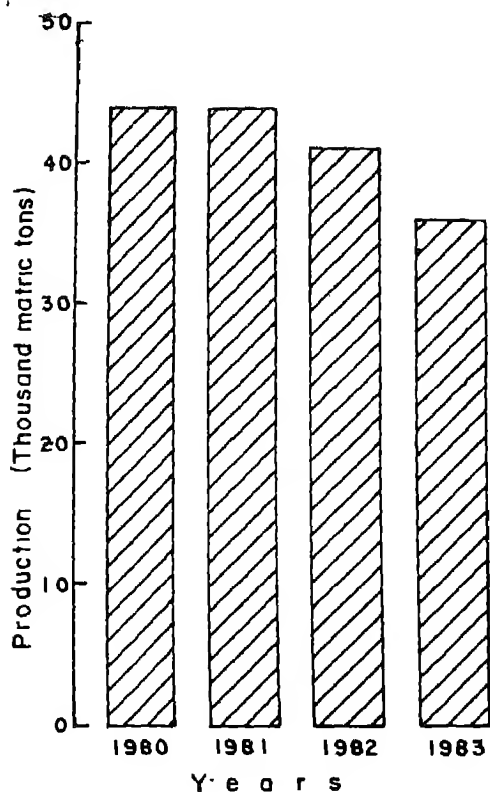


FIG 59 World—Production of uranium, 1980-86

been out of reach of many developing nations. In future, uranium production may go up provided the developing countries also obtain nuclear technology for generating power.

Thorium

The major source of thorium are thorianite, allanite and monazite. Sri Lanka and Malagasy are the main producers of thorium. Ratnapur district in Sri Lanka is important for thorianite reserves. Allanite is brownish and blackish in colour and is found in granular form embedded in granite and other igneous rocks. In India, its reserves are found in Rajasthan and Andhra Pradesh.

The major ore of thorium in the world is monazite. It is a greyish mineral with yellowish lustre and is a constituent of granite and pegmatite. Monazite reserves are found in Brazil, Australia, Malaysia, Sri Lanka and coastal part of India. Its reserves are also available in Montana, North and South Carolina, California and Florida states of United States of America.

Water Energy

The energy from water is obtained from its flow. Water, falling from a height, is an important source of energy. The higher the fall of water, greater is the capacity of water power generation. Hence, the continuous flow of water, its quantity and slope of land are important conditions favouring water-power generation. These conditions naturally exist in hilly and highland areas. In plains, dams are constructed so that water is discharged from a height to run generators.

Water-power was harnessed to run the water-mills. In late eighteenth and early nineteenth century, most of the industries were located near water-falls. Its importance declined only after the introduction of steam energy during mid-nineteenth century. With the development of a suitable technology for hydro-electric power generation, the importance of water energy has been re-established.

Water is a source of clean energy which does not pollute the environment. It can be transmitted to long distance through wires and cables but there could be transmission losses if transmitted to very long distances. It is, therefore, necessary that the industries are located near the power-generating sites.

It has some disadvantages. It cannot be stored for future. Therefore, the markets should be fixed before its generation. Large amount of capital is required for making dams on rivers, fixing machines and turbines and laying the transmission lines. Technical and scientific skill is required to manage its production and distribu-

tion. In a number of countries, where no other source of energy was available, water power made the economic development possible.

Norway, Switzerland, Canada, Sweden and New Zealand have harnessed their water resources to generate energy. About 75 percent of the total electricity utilised in South America is hydro-electric power. Japan, United States of America and Soviet Union are the leading countries in production and consumption of hydro-electric power. Almost all sources of water-energy have already been tapped in Europe.

In India, the generation of hydro-electric power was emphasised from the First Five Year Plan itself. A number of multi-purpose projects were launched. Bhakra Nangal project on river Sutlej, Bokaro, Panchet and Tilaiya in Damodar Valley, Hirakud, Rihand, Nagarjuna Sagar, Kosi and Koyana etc are the examples of such multi-purpose projects. Narmada Sagar project is another such project which is under construction.

Development of hydro-electric power has made it possible to locate industries even in those areas where it was not possible earlier due to lack of power. Switzerland generates more hydro-electric power than her requirement and, therefore, exports it to the neighbouring countries. Such possibilities also exist in Nepal and Bhutan.

Non-Conventional Energy Resources

The energy crisis experienced during the seventh decade of the present century forced the scientists to develop alternative sources of energy which are renewable. Mineral oil and coal are exhaustible. Large scale utilisation of wood may lead to deforestation causing environmental degradation. Thus, the need was felt to develop and harness such sources of energy which are renewable and may be used for longer period of time. The major sources are biogas, solar, wind and nuclear energy. Besides, attempts are being made to harness energy from waves and tides. Geothermal energy sources are other dependable

resources.

Biogas

Biogas is a clean source of energy. Natural gas is found in the form of hydro-carbons which is exhaustible. Petroleum may also be converted into gas but it is also non-renewable.

In Indian villages cowdung cake is used as a source of energy particularly for cooking purposes. Thus the burning of cowdung cake deprives the soils of good manure which is very important for maintaining soil fertility. In India successful experiments have been done for developing *Gobar-Gas*. National Biogas Development Project has also been launched. During 1985-86, 1 lakh 93 thousand biogas plants have been installed, bringing the total number of such plants to 6.5 lakhs. It had been proposed to install 1.51 lakh biogas plants during 1986-87 for which a provision of 59 crore rupees was made. Thus, the expansion of biogas plants will meet the fuel need of the farmers and they will not be deprived of the rich manure. It may also help in conserving the conventional sources of energy. China is another country where bio-gas project has succeeded.

Solar Energy

Solar energy is the most widely available and non-exhaustible source of energy. It is being used for water heating and cooking purposes at many places. It is available in plenty in the tropical region for longer periods in a year. This energy can be directly converted into electricity with the help of photo voltaic cells. These photo-voltaic cells are made of silicon which is a commonly found element on the earth. Ever since the energy crisis, solar cells have become an important source of energy. About 60 companies in 20 countries of the world are manufacturing solar cells at the commercial scale. The United States of America is the largest producer of solar cells.

Now Japan is coming up in its production. France, Italy and the Federal Republic of Germany are also developing solar cell industry. Australia, Belgium, Brazil, Canada, China, India, Mexico, the United Kingdom, Soviet Union and Spain are small scale producers of photo voltaic cells.

Solar energy may play a crucial role in rural electrification. It will also be available for pumping water, refrigeration and irrigation. Solar cells are costly items but the prices may decrease with increase in production. It is estimated that by the early twenty-first century 20 to 30 percent of the total demand of energy will be met by the solar energy.

Wind Energy

Successful experiments of harnessing wind energy through wind mills were conducted long time back in the Netherlands. Wind power is being used for generating electricity in United States of America. In California 4,700 new turbines were installed by 1984 to generate electricity which are turned by wind. California has more than 90 percent of the wind-farms in United States. The major problem faced by the devel-

oping countries is the availability of technology for harnessing non-conventional source of energy. It is very costly and demands huge investment, which the developing countries are unable to afford.

Geothermal energy is another source which can be harnessed. Many countries have obtained energy from the hot water coming out from hot-springs. However, such technology has not yet been found by which energy could be harnessed from the heat stored below the earth's surface. Such a technology may be obtained in future.

On the sea coasts, waves hit the coast line constantly and tides also come every day. In both these movements oceanic water rises. This rising water may be used for generating energy. This energy has not been utilised at a large scale. Nevertheless it has great possibilities.

It takes time to use one energy resource in place of the other. It took about 100 years to utilise oil in place of coal. Thus, it may take time to switch over to the non-conventional energy resources from conventional sources of energy. It is mainly because of the required changes in the total technology. However, the energy crisis has clearly indicated towards the need for developing non-conventional energy sources.

EXERCISES

Review Questions

1. Answer the following questions briefly:
 - (i) Classify the coal into different types and discuss the main characteristics of each type.
 - (ii) Present a detailed description of the distribution of mineral oil in the United States of America, Soviet Union and West Asia.
 - (iii) Name the important ores of nuclear energy and discuss the distribution of uranium in the world.
 - (iv) Evaluate the steps taken for the development of biogas in India.
 - (v) Write an essay on the development of solar energy in the world. What are the main advantages of solar energy.

Cartographic Work

2. Represent the following data by pie-diagram and discuss the changes in the positions of different coal producing countries.

Coal Producing Countries of the World

1980			1986		
Country	Production (in '000 metric tonnes)	Percentage of world production	Country	Production (in '0000 metric tonnes)	Percentage of world production
United States of America	710,388	26.04	China	897,000	27.78
China	596,004	21.85	United States of America	722,892	22.38
Soviet Union	492,924	18.10	Soviet Union	512,892	15.88
Poland	193,116	7.07	Poland	192,084	5.95
United Kingdom	130,092	4.77	South Africa	177,180	5.49
South Africa	116,040	4.25	India	163,344	5.06
India	109,104	3.99	Australia	159,672	4.94
F.R. Germany	94,488	3.46	United Kingdom	116,883	3.62
Australia	73,632	2.70	F.R. Germany	87,132	2.70
Czechoslovakia	28,308	1.04	Czechoslovakia	25,236	0.78

Source: Monthly Bulletin of Statistics, December 1987
United Nations Office

3. Represent the following data with the help of a suitable diagram and discuss the differences between 1980 and 1986.

Major Oil Producing Countries of the World

1980			1986		
Country	Oil production (in '000 metric tonnes)	Percentage of world oil production	Country	Oil production (in '000 metric tonnes)	Percentage of world oil production
Soviet Union	653,471	21.94	Soviet Union	614,748	22.23
USA	495,720	16.64	USA	428,160	15.48
Saudi Arabia	424,200	14.24	Saudi Arabia	250,224	9.04
Iraq	129,864	4.36	China	130,323	4.71
Venezuela	114,792	3.85	United Kingdom	120,516	4.36
China	105,948	3.56	Venezuela	93,984	3.40
Nigeria	102,204	3.43	Iran	92,664	3.35
			Nigeria	72,768	2.63
Total of the 7 countries		68.02	Total of the 8 Countries		65.20

4. Show the coal and uranium mining areas on the map of the world.
5. On a map of western Asia show the distribution of mineral oil.

Project Work

6. Visit a gobar gas plant or a wind mill in your village or city and draw a sketch to show its working.

CHAPTER 6

Conservation of Natural Resources

MAN utilises natural resources for his livelihood. Every man was dependent on plants and animals which were available in his environment. At that time, density of population was low. Needs of human beings were limited and the level of technology available to them was primitive. Therefore, those societies never felt the need of conservation as the regenerative processes compensated for the utilisation. With the scientific progress and technological development, man started utilising these resources at a much larger scale. Continuous rise in population has caused an increasing demand for resources. This competition created a situation in which the non-renewable resources may come to an end after some time.

It seems that the large scale consumerism has brought the mankind at a state where our needs have gone beyond the means to fulfill them. In our desire to reach the maximum production limit, we have started taking loans from the resources meant for future and which cannot be paid back. As a result we are using all those resources which are in fact the future generation's property. It is a matter of great concern today

Need for Conservation

Our resources are meant not only for the utilisation of the present generation but also for the future generation. Therefore, a balance between the growth of population and the utilisation of

resources is absolutely necessary. This balance may ensure the continuity of human race. Any imbalance in either of the two may disrupt the continuity of our economic, social and cultural development.

The interactive relationship between various economies and the natural resources in the world have multiple facets. For example, the increase in population has resulted into decrease in rainfall and ground water levels. The smokes and fumes emitted by vehicles and machines enhance the level of carbon-dioxide in the air which has an adverse effect on different elements of weather. These changes have a bad impact on agricultural production which in turn affects food supply and hence the human population. Even soil erosion affects agricultural production. For ensuring food supply to our future generation, it is necessary to check soil erosion.

The non-availability of resources and their price-rises are having an adverse effect on the economies of many countries. During 1980's, the world has experienced a state of imbalance between the growth rates of population and economic development. Such a situation was not present during 1950-1973. During this period the petroleum production witnessed an annual growth rate of 7.6 per cent which resulted in high growth in agriculture and industry. After 1973 there was an abrupt hike in the price of petroleum pushing up the price of energy. As a result, the growth rates of food production and economic

TABLE 6.1
The Pattern of the annual growth rates of world economy and food grain
production at 3 levels of petroleum prices.

Year/Period	Petroleum price per barrel (in dollar U.S)	Growth rate of economic production (Per cent)		Growth rate of food production (Per cent)	
		Total	Per Capita	Total	Per Capita
1950-73	2	5.0	3.1	3.1	1.2
1973-79	12	3.5	1.7	1.9	0.1
1979-84	28	2.0	0.3	2.0	0.3

Source: State of the World, 1985 p 8

development suffered setbacks. This is evident from the data presented in the following table.

The above data reveals that during 1950-73 when the price of petroleum was 2 dollar per barrel, the economic production and the food grain production witnessed a growth rate of 5.0 and 3.1 respectively. With the increase in petroleum prices, (28 dollar per barrel) the economy of the world suffered adversely and the economic and food grain productions witnessed a decline. Study the figures given in the table and give the growth rates of economic and food grain productions during 1973-79 and 1979-84. There are a number of other examples of the problems created by over utilisation of resources. On one hand it is difficult to meet the demand of fresh water for agriculture and industry, on the other many areas suffer from the problem of water-logging because of over-irrigation. In many regions of the world, the underground water is being utilised at a very large scale for foodgrain production. This has resulted in lowering of the water table e.g. in northern China. The expansion of tube-well irrigation in many states of India has led to the lowering of the water table due to over-pumping from underground aquifers.

The above examples clearly plead for the need of conservation of resources. Now it has become necessary to conserve soil, mineral, air, water,

forests, wild-life and fish resources.

Methods of Conserving Resources

It is true that resources are to be used by human beings but they should be used in a way that imbalance does not take place. The ancient dictum in India "tyakten Bhunjitha". (concept of consumption along with sacrifice) indicates towards the method of checking the state of imbalance. Even in those days people utilised resources. We cannot imagine the environment without human beings as they are integral part of the environment. But earlier when a tree was cut, another was planted and thus preservation was practised. Terraced farming in hilly region is an ancient technique. The modern awareness about the preservation and conservation of resources and environment has been created due to the fear of the situation which may arise as a result of large scale destruction of natural resources. It is difficult to imagine a world economy without oil, coal or any other mineral. In this context it should be understood that the concept of exhaustibility of resources is always linked with the level of technology available. It is possible for example, to get coal or oil at greater depths but the available technology may not be suitable to drill oil from such depths or it is too

expensive.

The human beings will have two alternatives in such a situation. Firstly, an efficient and sophisticated technology may be developed which enables extraction of minerals from greater depths. Secondly, alternative sources of energy e.g. solar, wind or water will have to be developed in order to reduce dependence on conventional sources of energy. Recently there has been a growing awareness the world over to conserve resources.

Soil Conservation

Soil is the medium for plant growth. These plants in turn support different types of life-forms. Crops, grasses, fruits, flowers, vegetables and trees grow in the soil. Soil is a renewable resource but certain problems such as erosion and leaching make it necessary to adopt suitable methods for their conservation.

The greatest loss to the soils is caused by erosion for which physical and cultural factors are responsible. Physical factors include slope, intensity of rainfall, velocity of wind, drift of glaciers etc. Cultural factors include deforestation, over utilisation of soil, overgrazing and unscientific agricultural practices. Soil conservation measures are selected on the basis of the local condition of terrain and climate.

Terracing, contour ploughing, controlling the shifting cultivation, afforestation, plugging the gullies and controlling the headward extension of the gullies are some of the important methods of soil conservation which can be adopted in hilly and mountainous areas.

^{wind} Aeolian action is the most important agent of soil erosion in dry and desert regions. Destruction of trees and vegetations causes unobstructed blowing of wind with high velocity. Plantation of tree in desert regions is, therefore, an effective method of checking soil erosion. Rows of trees are planted after short distances to form shelter belts. After harvesting, fields are devoid

of any cover and are subjected to soil erosion. In order to avoid it, crops should be cut leaving about 30 to 50 cm of stem in the ground so that they could act as wind breaker. Overgrazing should be avoided in order to conserve soil. In Israel, petroleum jelly has been used to stabilise sands and arrest the wind-erosion.

Gullying is a major problem of the plains especially in the areas of clayey soil. In such areas, soil erosion may be reduced by bunding the fields, controlling the overgrazing, adopting scientific crop rotation practices, using green and farm yard manure and controlling the flow of rain water in the drains and rivulets.

Fertility is the most characteristic quality of soil. It should be conserved. The loss of fertility of soil leads to the decrease in productivity. The soil fertility may be replenished and renewed by intensive manuring, applying fertilisers and gypsum, crop-rotation and leaving the fields fallow. Thus, the soil will get renewed.

Soil erosion is a serious problem in developing countries. However measures for checking soil erosion can be adopted on the basis of local conditions. This requires not only planned programme but also large capital investment.

Water Conservation

Water is the basis of life. Two-third of the total earth's surface is covered with water. It supports all forms of life—vegetative, animal and human life. Water is utilised for agriculture, industry, transport, energy and domestic uses. Therefore, conservation of water means conservation of life itself.

Water is a cyclic resource which can be scientifically cleansed and used again. The main sources of water on earth is precipitation in form of rain or snow. If water is utilised judiciously, its supply should be sufficient. However, in some parts of the world the water is scarce. While some regions suffer from drought due to absence or lack of rainfall, others suffer from flood due to

very heavy rainfall. The natural sources of water are rainfall, snowfall and ground water. The rain water flows through the rivers and rivulets. This water can be impounded by making dams on rivers and can be used. A number of large dams have already been constructed world over e.g. Bhakra, Hirakud and Rihand in India, Aswan in Egypt, Tarbela in Pakistan, Coulee and Hoover in United States of America.

Water is used maximum for irrigating crops. If the amount of this is saved, the surplus may be diverted for other uses. Seepage losses from irrigation canals can be minimised by lining them. Sprinklers provide very effective and efficient technique for irrigation. It not only economises water but also effectively irrigates undulating lands. No doubt, it is capital intensive but it checks the water losses through seepage and evaporation.

Drip or trickle irrigation technique helps in conserving water through evaporation because the water is provided through underground perforated pipes near the roots.

There is a great demand of water in industries. The economy in water-use in this sector will have two benefits. Firstly, the saved water may be used to meet the demand in other sectors. Secondly, the effluents thrown out by industries in rivers will be less. Water, in most of the industries, is used for cooling purposes, thus, it is not necessary to use fresh portable water. The recycled water may be used for this purpose. By using the recycled water over and over again, fresh water can be conserved. Demand of water for domestic use can also be reduced. For example, in most of the urban areas, about 12.5 litres of water is used in one flushing. In U.S.A., cisterns have been designed in a way that they require 18-22 litres of water in one flushing. In Federal Republic of Germany, on the other hand, cisterns require only 7 litres of water per flushing. Thus if each individual makes a habit to economise water-use a large quantity can be conserved.

Air Conservation

Existence of life is dependent on air. Therefore, our health is also dependent on the purity of air. Though some natural impurities are present in air, many are added by human beings. The dust storms add dust particles to the air. The ash coming out of volcanic eruptions also pollutes the air. Besides, human beings are polluting air at a very large scale which is more dangerous. The mineral oil after burning in combustion engines generates sulphur and nitrogen oxides. Coal is used for smelting ore and its smoke is released in the atmosphere. This smoke generally creates smog during winters.

It is extremely difficult to keep the air pure. It can be attempted in two ways; firstly, by developing proper technology and secondly, by imposing heavy tax. Till now, factories and thermal power houses tried to control the air pollution at the local level by throwing the smoke in the sky through tall chimneys. However some part of the pollution used to reach neighbouring rural areas. It is, therefore, a compulsory condition to fix scrubbers in the chimneys of thermal power stations in Netherlands, Federal Republic of Germany and United States of America. These scrubbers intercept the ash particles from entering into the air. Thus, the quantity of sulphur dioxide in the air is reduced. Techniques to clean the fumes and smokes in cars and other vehicles are being introduced. Tree plantation is an easy technique to ensure fresh air. Green belts are important components in the neighbourhood of the settlements. In Japan, large scale plantations are being done to reduce the air pollution in industrial areas.

Conservation of Forests and Wild-life

Forests are important components of our environment as well as economy. The large scale utilisation of forests in response to the increasing

demand of growing population, diseases of trees, and forest fires are the major causes for the degradation of forests. There are several measures for forest conservation.

One of the most important measures of forest conservation is to plant trees. Afforestation, preventing the felling of immature and young trees, and creating awareness amongst the local people about the importance of forests may help in conserving forests. The '*Chipko movement*' in India is an example of such an awareness about conservation of forests. Using chemical insecticides to control diseases of trees and prevention of forest fires are other important steps in this direction. Sometimes forest fires take place due to some natural cause, otherwise they are generally caused by the negligence of human beings about which it is necessary to create an awareness.

Wild-life have an important contribution towards maintaining diversity of life. The colourful birds, animals and other life forms in the forests are very important for maintaining the ecological balance. Each individual species contributes towards continuation of the food chain. The disappearance of forests or its reduction in size will automatically cause the disappearance or reduction in the number of wild-life. Their conservation is essential to save them from extinction. The establishment of national parks and wild-life sanctuaries is a constructive step towards the conservation of wild-life. These also have great educational value. Hence they should be conserved and it is possible only through proper maintenance. Many countries have passed laws and have declared the killing of birds and animals as illegal. In India restrictions have been imposed on the killing of lions, tigers, deers, chital, great Indian bustard and peacocks. These laws should be followed strictly in order to have some impact on wild-life conservation.

Fish Conservation

Fish has an important place in the ecology and economy, as well as a food resource for human

beings. In 1985, the total fish catch was 8.5 crore metric tonnes. This surpassed the total meat production in the world. Fish contributes about 23 per cent of the total animal protein available to human beings. Fish resources have been greatly damaged by over-fishing. The catching of the endangered species should be banned by the U.N. under the law of the sea. The holes in the net should not be less than a prescribed limit so that immature fish escape through it. The industrial effluents and leakage of oil from tankers and ships have also adversely affected the number of fish.

Most of the fish lay their eggs in estuaries. It is, therefore, necessary to keep the estuaries free from industrial effluents and other chemical pollutants.

Like livestock and poultry farming, fisheries should also be given encouragement. Pisciculture has been an ancient activity in China. This should be organised on scientific basis. The National Institute of Oceanography in India is engaged in extensive research on development of fisheries.

Conservation of Mineral Resources

Most of the minerals are exhaustible resources, therefore, they need to be conserved. The efficient utilisation of minerals is a positive step towards conservation. Better the technology of the extraction and purification higher will be the availability. Recycling of minerals is another method of conservation. Though all minerals need to be conserved, greater emphasis is required on the conservation of certain important minerals such as coal, oil and metallic minerals.

Coal has been used as a source of energy for hundreds of years. Its demand, production and the process of extraction have undergone change from time to time. Coal resources are damaged because of the collapse of roof of the coal mine, flooding and fire. The coal mines have to be saved from such eventualities. It can also be con-

served by improving the mining techniques and developing more efficient technology to drive more energy from a given quantity of coal. Sometimes coal mines are filled with gases and explosion occurs. Protection of mines from such explosions will go a long way in conserving coal. The use of alternative sources of energy like biogas and solar energy should be increased to save coal.

The exploration and use of mineral oil has revolutionised the economy of the world. It is an efficient source of energy and hence it is in great demand. The peak of utilisation of mineral oil was achieved in 1979. The increase in the prices of mineral oil and the energy crisis were the main causes for the realisation of the importance of the alternative energy sources. By 1979, a decrease of 14 percent in the over all utilisation of mineral oil has already been recorded. Mineral oil can be conserved in two ways; firstly, by improving the technology and secondly, by increasing efficiency in utilisation. It may also be conserved by restricting oil-intensive activities. It is necessary to experiment and search for a substitute of oil. Natural gas, hydro electric power and other

fuels may be used for central heating of residences in cold countries. For example, in USA about 0.2 crore barrel oil was burnt every day for central heating of residential and commercial buildings in 1973 but it fell down to 0.12 crore barrels in 1982 registering a decline of 43 percent. It can also be conserved by regulating the speed of vehicles and proper maintenance of machines.

Iron ore, tin, aluminium and copper etc have great economic importance hence they need to be conserved. Increasing demand and continuous mining of metallic minerals may lead to their exhaustion. It is, therefore, essential to use them economically. Wherever possible, the metals should be recycled. Japan is an appropriate example where there are no iron ore deposits, but scrap iron procured from all parts of the world is used as raw material for iron and steel industry. Rust is an enemy to iron which causes corrosion. The tools and items made of iron can be conserved by applying paints, grease and oil.

The conservation of today will ensure a strong economy for the future generations.

EXERCISES

Review Questions

1. Answer the following questions briefly:

- (i) What do you mean by conservation of resources? Why is conservation necessary?
- (ii) Discuss the causes of soil erosion and suggest the measures for soil conservation.
- (iii) Ocean is the store-house of food for future. In the light of the above statement discuss the methods of fish culture and conservation.
- (iv) "Water is the basis of life hence its conservation is the conservation of life." Discuss.
- (v) What are the major uses of mineral-oil? How can it be conserved?
- (vi) What are the measures of forest conservation? Discuss the importance of wild life for ecological balance.

2. Fill in the blanks.

- (i) The rows of trees planted to check the wind velocity are known as
- (ii) A lot of water can be wasted through if the canals are not lined.

- (iii) is an important process of soil erosion in clayey areas.
- (iv) The technique of irrigating the plants through underground perforated pipes is known as irrigation.
- (v) It is easier to irrigate undulating lands through

Project Work

3. Collect information regarding methods used for the conservation of vegetation and soil in the vicinity of your residence or school. Discuss the findings in your class.

CHAPTER 7

Utilisation of Natural Resources

EVERY human being fulfills his basic necessities first and then turns towards philosophy, fine arts, aesthetics and other higher needs of life. For satisfying these needs, human beings perform certain economic activities. These activities are extremely diverse because there are wide differences in resource endowment and the technologies available for exploiting these resources. As a result, different regions vary in the level of development. The early man gathered nuts, fruits and roots from forest and hunted wild animals for his subsistence. With the development of technology, they started using the resources such as forests, land, minerals and sources of energy. Gradually the present form of economy developed.

workers engaged in these activities cannot have higher purchasing power. As a consequence the demand for industrial goods will go down which is detrimental for the growth of the secondary sector and such an economy will remain weak.

Different sectors of economy are complementary to each other. For example, chemical fertiliser is a product of the secondary sector but it is used for the development of agriculture. Demand for fertilisers would be more in a developed agricultural sector, and thus the primary sector influences the secondary sector as well. Trade and transport link the producer and the consumer. People engaged in different professions provide specialised services which help other sectors of the economy.

Sectors of the Economy

The economy of a country is tailored by her citizens. The economy of any country has three sectors; primary, secondary and tertiary. These sectors are closely linked and, therefore, each sector affects the other. Agriculture is an activity of the primary sector but it provides raw materials for agro-based industries. These raw materials are used for manufacturing finished products. If agricultural sector develops, the purchasing power of farmers increases and they buy goods manufactured in the secondary sector. Thus it promotes secondary sector. If the primary sector is under-developed and weak, the

AGRICULTURE

Agriculture is the most widely adopted and important occupation of human beings. More than 50 percent of the world's population, even now, is engaged in agriculture. In developed countries the percentage of work force engaged in agriculture is less than 10 percent whereas in developing countries it is about 75 percent.

Agriculture is an ancient occupation. The ancient civilisations of Mexico, Nile Valley, Mesopotamia, Mohanjodaro and Harappa and Wei Ho Valley in China developed along with the development of agriculture. In ancient times,

Indians were advised to grow more crops as the verse in *Taitriya Upanishada* suggests: "*Annam bahu Kurweet, tadvratham*" (grow more food, that is thy duty). In many countries, besides being an economic activity, agriculture is also a way of life which is reflected in their rites, rituals and other cultural elements. We can cite India as an example. Whether it is *lohti* or *holi*, *pongal* or *onam*, in spite of being celebrated in different parts of the country, they are closely linked with agricultural operations. Regional variations are also found in the methods of cultivation and in agricultural systems because they have developed in response to their adaptation to the varying environmental conditions.

Type of Agriculture

Different kinds of agriculture are practised in varying environmental conditions.

Shifting Cultivation

It is a form of primitive agriculture. It represents the first human attempts to grow food for their subsistence. It is still found in some parts of the world with some of its original characteristics. All these regions are however, located under such environmental conditions where permanent agriculture is difficult. Three such regions are distinctly identified. The largest region extends on both sides of equator in Africa. The second region lies in north-eastern part of India and south-east Asia. The third region lies in parts of Central America and South America. Shifting cultivation is known with different names in different regions e.g. it is known as '*Jhuming*' in north-east India, '*Ladang*' in Malaysia, '*Chengin*' Philippines, '*Milpa*' in Central America and Mexico, '*Konuko*' in Venezuela, '*Roka*' in Brazil and '*Masole*' in Zaire basin. The area under shifting cultivation is decreasing everyday. What could be the reason for this?

The shifting cultivator clears a small piece of

forest by felling the trees and cutting the bushes and grasses. These are then burnt and hence it is also known as 'slash and burn' agriculture. Sometimes the vegetation is burnt without felling it. The ash obtained by burning the vegetation is mixed with the help of a pointed branch or a sharp and pointed tool and seeds are sown in them. Ploughs are not used for tilling the soil.

The tropical region, where shifting cultivation is prevalent, have high temperature and heavy rainfall. Therefore, the soil is deficient in organic matter. The soluble soil nutrients are lost due to leaching induced by heavy rainfall. But ferrous and aluminium oxides being insoluble are left out. Thus the fertility of the soil is lost due to leaching, lack of organic matter and the bad effects of burning the vegetation. This kind of cultivation can be done at a place only for two to three years.

In this type of agriculture mainly food crops are grown because it is meant for subsistence. Maize, cassava, banana and sweet potato are the main crops. Whatever production is obtained is finally consumed locally and there is hardly any surplus. Per hectare and per capita productivity is very low. Low carrying capacity of land has resulted into very low density of population in almost all these regions.

The same process is repeated by the farmers who leave one patch of land due to the depletion of soil fertility and shift to the other piece of land. The bushes, grasses and other vegetation regenerate on the abandoned piece of land. Sometimes the farmers again return back to such lands in order to cultivate it temporarily for the second time after 10-15 years. This is known as "bush fallow" agriculture.

The shifting cultivation has been widely criticised on two counts. Firstly, it is responsible for deforestation and loss of natural vegetation leading to environmental degradation. Secondly, it leads to soil erosion and soil loss. In spite of these obvious drawbacks, it is quite interesting to understand how these people have been able to

strike a balance between the environment in which they live and the type of economy they have adopted.

It cannot be denied that the carrying capacity of shifting cultivation is very low. Hence it is difficult to increase the per hectare and per capita productivity which is very essential in this system of agriculture.

Sedentary Agriculture

Man was a nomad for a long period in the history of his economic development. As a gatherer, hunter, nomadic herder or a shifting cultivator, he was moving from one place to the other. He felt the need of settling down in a place after learning the art of cultivating the soil to grow crops.

In sedentary agriculture one or more households live in a group permanently at one place and grow crops. In some areas, ownership of the land is collective but mostly it is private. Sedentary agriculture is characterised by several features. Farmers adopt a particular cropping pattern and follow soil conservation methods. They protect the fertility of the soil by crop rotation. Livestock farming becomes an integral part of agriculture both as a means of supplementing the income of the farmers as well as for providing help in different agricultural operations. Animals are also important sources of manure. The farmers use different types of agricultural implements in accordance with the level of their economic development. Depending upon the environmental conditions and the duration of growing period, they grow more than one crop. They also engage themselves in other activities such as making ropes, basket etc. to supplement their income, though for short periods only when there is no work in agriculture. Farmers living on forest margins do some gathering from these forests. Similarly farmers living near large plantations, also do work on these plantations besides working on their own fields. In India mostly seden-

tary agriculture is practised. Sedentariness has influenced the socio-cultural life of people in different regions, for example, in India the concept of *gram devata* or *gram devi* could be attributed to the sedentariness of the village folk.

Intensive Agriculture

Intensive agriculture refers to a system of crop farming in which on small land holdings by applying higher inputs of capital and labour per hectare of land, yield per hectare is quite high. Rice is the main crop. The main objective is to increase the crop yield. In any region, food production can be increased in three ways. Firstly, it can be accomplished by increasing the land under cultivation but availability of land per capita (man-land ratio) is very low in densely populated countries. Therefore, expansion of agricultural land is not possible because of non-availability of land. Secondly, quantum of total food production can be increased by intensification. In region of intensive agriculture, farmers work on their small size holding with the help of their families. They use improved or high yielding varieties of seeds, apply farm yard manure and chemical fertilisers for replenishing the soil fertility, and make arrangement for irrigation water for taking better crop. For protecting the crop, they also use insecticides and pesticides. All these steps increase the per hectare capital investment but it also enhances per hectare productivity. Thirdly, the low value crops are substituted with high value crops and the farmers get higher returns through sale of these crops.

In most of the countries where intensive agriculture is practised, the density of population is also very high. This has created pressure on cultivable land. This type of cultivation is done in Japan, Bangladesh, Philippines, Malaysia, Thailand, Vietnam, India and Indonesia.

Extensive Agriculture

It is a large scale farming on large holdings with the help of sophisticated agricultural machines. This type of cultivation has generally been adopted in the areas of low population density with high man-land ratio. The low availability of labour and high wage rates have made it necessary to use large farm machineries. One of the basic features of extensive farming is its low per hectare productivity but the total production is very high due to large area under cultivation. The number of human labour employed is very low. Therefore, per labour productivity is higher.

Historically extensive agriculture developed during early nineteenth century. Most of the countries, where extensive farming is done, are economically developed. These countries introduced extensive agriculture in grasslands found in the interior parts, where initially the main occupation was livestock rearing. The soil and moisture conditions which are favourable for growing of grasses are also found efficient for growing crops. Continentality is the main feature of the climate of these regions. Due to their interior location they are devoid of any moderating influence of the oceans. Though the amount of rainfall is low due to distance from the oceans, its effectiveness is high due to low temperature and consequently low evaporation. The major regions of extensive agriculture are prairies of Canada and United States of America, pampas of Argentina, steppes of Soviet Central Asia and Downs of Australia.

The size of the farm in this system is large. There are as big farms as 1600 hectares. The farming operations are fully mechanised. Tractors for ploughing, levellers for levelling, seed-drills for sowing, and combined harvesters for harvesting and threshing are widely used. Specialisation in one or two crops is another important feature of this type of farming. Wheat, for example, is the main grain commercially produced in the erstwhile-grasslands. Large scale

production and need for its storage has made silos and elevators important elements of the agricultural landscape in these regions.

Subsistence Agriculture

This type of agriculture is organised by the farmers with the sole objective of sustaining their families. The specialisation of crops is not possible in this system as the farmers grow as many crops as are required for their household consumption. This is the main reason for a varied cropping pattern in which cereals, pulses, oil seeds and hemp etc. are grown. Two main forms of subsistence type of agriculture are available in the world. Firstly, the primitive subsistence agriculture which is synonym to shifting cultivation. Secondly, the type of subsistence farming prevalent in the monsoon regions of south-east and east Asia. The high density of population has forced the people to use the land very intensively. Rice is the main crop in this region.

The farmers have adopted two methods of rice cultivation viz. transplanted rice in flooded fields and irrigated rice in the terraced fields of upland regions.

Rice cultivation, is done here in small fields after flooding. Most of the operations are done by hand as machines cannot be operated for ploughing and transplantation in the muddy flooded fields. Greater use of human labour is possible due to high density of population in these areas. Multiple cropping is another important feature of intensive agriculture.

Intensive cultivation causes depletion of soil fertility and farmers attempt to maintain it by applying farm yard manure, compost, green manure and chemical fertilisers. Japan uses the highest quantity of chemical fertilisers per hectare. It has also devised a number of small machines which can be easily operated in flooded fields.

In these regions where the rainfall is low and growing season is limited for rice cultivation,

other crops like wheat, barley, maize, jowar, bajra, soyabean, oilseeds and pulses are grown. Such a varied cropping pattern exists on the peninsular plateau of India, north China and Manchuria and north Korea. Jowar and bajra are important crops of dry regions of the Republic of Myanmar (Burma).

Commercial Agriculture

The main aim of commercial agriculture is to sell the produce in the market and, therefore, the crop-specialisation is one of its characteristics. Two major forms of this type of agriculture are found in the world: the commercial grain farming in middle latitudes and the plantation agriculture in tropical regions.

In most parts of the middle latitudes, specialisation in wheat production has been attained at a commercial level. Prairies in North America, Ukraine in USSR, western Europe, Argentina in South America, southern parts of Australia, and in Punjab, Haryana and plains of western Uttar Pradesh in South Asia, have attained such a specialisation.

Most of the operations in this type of agriculture are done by machines. In United States of America some farmers come from outside to these agricultural farms. Two terms, '*sidewalk farmers*' and '*suitcase farmers*' are often used to describe such farmers. Though the agriculture is not highly commercialised in India, a certain level of commercialisation has been attained. The mechanisation level is still low. In your opinion, to what extent mechanisation of agriculture is appropriate in India?

Plantation agriculture was historically developed by Europeans during the colonial period. It is well managed and organised system of agriculture in which management and organisation can be compared with manufacturing industry.

Traditionally plantation agriculture had some basic features. It was introduced in the countries of the tropical regions which had low density of

population. It covered large areas. Its main objective was to produce crops for trade. In the beginning the capital was invested by the colonial powers. A large number of labour was employed for agricultural work who were either native people or were brought from outside as bonded labour or who were paid wages. Management of large farms was in the hands of the foreign colonisers. It is an agriculture in which large scale specialised production is due for trade. The tea plantations on Assam hills, Darjeeling and Sri Lanka, rubber plantations of Malaysia and coffee fazenda of Brazil are examples of plantation agriculture. This type of agriculture is both, labour as well as capital intensive. Most of the processing is done on the plantation itself.

Majority of the plantations in the world are located near the coasts or the banks of navigable rivers or near the rail and road routes. Cheaper means of transport are very essential for this type of trade-oriented agriculture.

The size of plantation varies from region to region. Generally it varies from 5 to 40 hectares but in some regions it is very large. For example, the Firestone rubber company owns a 54.4 thousand hectare rubber plantation at Harbel in Liberia.

The main characteristics of plantation agriculture have undergone major changes after the end of the colonial period. Though large plantations were originally organised by the colonial powers, now most of these are under the ownership and control of local governments, corporations or companies. Now these plantations sell their produce for local consumption also along with their production for international trade.

Mixed Farming

Mixed farming is a type of agriculture in which equal emphasis is laid on crop production and livestock rearing. An efficient combination of crops and livestock farming is the chief characteristic. The main objective is not only to pro-

duce cereal crops but also the fodder and cash crops on the same scale. Mixed farming is prevalent in the United States of America, western Europe and the fertile triangle of USSR (Triangle formed by joining Leningrad-Odessa and Irkutsk). The mixed farming region of United States of America coincides with its corn belt. Corn is used for feeding the animals. Oats, wheat and grass are other crops which are grown in combination with corn. Now soyabean has also been introduced in this region. It is a protein rich crop and, therefore, its area is being expanded for taking fodder crop.

In western Europe, mixed farming is done in France, Federal Republic of Germany, United Kingdom, Netherlands, Denmark and Ireland. The European Economic Community under its agricultural policy has provided an extensive market to its member countries for their agricultural produce. This organisation guarantees the sale of the marketable surplus, provides capital for modernisation and subsidises the agricultural production if the prices fall. These countries export milk and milk products, butter and meat.

Dairy Farming

Cattle rearing particularly rearing of milch cows in order to meet demand of milk and milk products in urban areas is referred to as dairy farming. Dairy farming in its real form developed in Europe in response to the demand of milk in industrial urban centres. Hence industrialisation and development of dairy farming are positively correlated in Europe. The concentration of population in industrial towns created demand for milk products which gave impetus to the development of dairy farming. High yielding milch cows now bred world over have all originally come from Europe. The Holstein-Friesian breed of Netherlands, GDR and FRG, Jersey from Channel Islands, Irish of Scotland and Brown Swiss of Switzerland are some of the best breeds of milch cows.

Dairy is highly labour intensive activity. Machines cannot look after the cows and, therefore, human labour is required. Generally dairy farms are organised near the urban centres. Canada, United States of America and New Zealand are other countries besides the European countries where dairy farming is important.

Dairy farming requires large capital. Elaborate buildings, machines for feeding, milching, cleaning, silos for fodder etc. require huge investments. Refrigeration and storage of milk are also expensive. Dairy farmers also grow fodder crops such as grasses, corn, oats and wheat. Ukraine, Latvia, Lithuania and Estonia are the important dairy farming regions of USSR.

The number of milch cows in a farm varies in different regions. The average number of cows per farm in United States of America is about 100.

The dairy farming in New Zealand has already been discussed earlier. Piggery is an important activity in almost all those countries where dairy farming is developed because the skimmed milk is available as pig-feed.

Dairy farming in India has been organised on sound footings in Gujarat through dairy cooperatives and they have been quite successful. Most of the states in India have set up dairy development boards for the development of dairy. Central Fodder Research Institute, Jhansi and National Dairy Research Institute, Karnal have been conducting research on dairy development. While the most important milch animal is cow in other parts of the world, it is buffalo in India.

Truck Farming

Cultivation of vegetables for market is known as truck farming. It is also closely associated with urbanisation. The concentration of large population in urban centres generates demand for vegetables. In order to meet this demand, the farmers grow vegetables in the urban fringe. Vegetable is a perishable commodity. It cannot be kept for

long. It is easier to send it to the market from the urban fringe. Due to development of means of transportation, area of truck farming has expanded. It is an intensive farming, which is done on small holdings with the help of irrigation, manure and high yielding varieties of seeds. Every effort is made to increase the per hectare yield. Refrigeration and cold-storage have made it possible to keep the vegetables fresh for a longer time. To meet the market demand the farmers have adopted *relay farming*.

Truck farming is more developed in the hinterlands of the industrial towns of Europe, California and north-eastern parts of the United States of America and Mediterranean region. India has a very long growing season and hence vegetables are grown in all parts of the country. Majority of Indian population is vegetarian. Besides, due to high price of meat, demand for vegetables is more and hence the importance given to truck farming.

Horticulture

Major products of horticulture are fruits and flowers. Both these items are produced by the farmers for trade besides meeting their own requirements. These are in great demand in urban centres. There is a great regional variation in production of fruits and flowers. Banana, mango, jamun, coconut, cashew nut, jack fruit are the major fruits of the tropical regions. Apple, peaches, walnut, figs, and berries are produced in temperate regions. The Mediterranean regions produce citrus fruits like oranges and lemons. The development of transportation has given impetus to horticulture because it is now possible to send these perishable commodities to the market when they are still fresh.

Flower is an important cash crop. It is in great demand in urban areas. The farmers from Georgian and Armentan SSR produce roses and sell them in Moscow during winter when they are not available there. Ethiopia exports onion

flowers to European countries during winters. The cultivation of tulip in Netherlands is famous all over the world. In India roses and marigold are widely grown. Rose cultivation on a large scale is done in the Pushkar valley near Ajmer. Floriculture has been introduced in the vicinity of Delhi. Kashmir valley is famous for flowers. Saffron is cultivated here on Karewa lands. Kashmiri people are very fond of lotus flowers. Kannauj, Jaunpur and Lucknow are very famous for manufacturing scents in which flowers are used as raw materials.

Types of Agriculture Based on Management

The management and organisation of different agricultural operations are important aspects of agriculture as an economic activity. Success and development of agriculture largely depends upon the efficiency and effectiveness of management. Like industries, ownership influences the factors of productions in agriculture too. Land and other factors of production are either owned individually by a farmer or collectively by all the farmers of a village. In some countries, land is owned by the society or the government. After the second world war, the economic systems of different countries have changed. Many countries were able to free themselves from colonial rule and became independent. They resumed land distribution system in accordance with their aspiration.

Peasant Agriculture

Peasant agriculture is organised by the farmers individually. They own the land as well as other factors of production. They work on their fields along with their family members. They hire labour if necessary. They pay land revenue to the government. Some farmers cultivate the land as share croppers or as tenants.

After independence in India, the zamindari and jagirdari systems were abolished and land was

given to the farmers. Land ceiling act was passed to fix the ceiling on land which a farmer can own. The surplus land was distributed amongst the landless. Land reform measures were taken by promulgating the land reform acts. All states are trying to correct the disparity in land ownership.

Cooperative Farming

It is organised on the principles of cooperation. All the members of the cooperative collectively own the factors of production. The farmers become the members of the cooperative society on their own. The members of the executive committee run the day to day business in a democratic manner. Every member works on the cooperative farm. The main feature of a cooperative farm is its large size, which ensures mechanisation and large scale production. It can also invest large capital which is not possible by an individual farmer.

Cooperatives have been successful to a great extent in some countries of Europe viz. Denmark, Sweden, Norway, Netherlands and Belgium. After independence cooperative movement was launched in India as well but it got little success in the agricultural sector. Cooperative sugar mills and sugarcane farming in Maharashtra and dairy cooperatives in Gujarat have achieved remarkable success.

Kolkhoz is a special type of agriculture farm in Soviet Union which has been organised on principles of socialism. Kolkhoz was introduced during the First Five Year Plan of Soviet Union on the principles of collective ownership of factors of production in the traditional agricultural regions. Accordingly, a number of families were collectively given permanent ownership of the state land without paying the rent. People work

on this land collectively. A managing committee looks after the administrative matters. The committee manages the sale of the produce, division of labour and the distribution of income amongst the members. The farm owns the agricultural machineries. They can also obtain such machineries from state owned machine-tractor stations.

Before 1966, the members of the Kolkhoz were given shares from the income of the farm but now the labour at different levels receive wages like sovkhoz. Thus, the character of kolkhoz has changed.

State Farms (Sovkhoz)

State farms are based on the Soviet model of sovkhoz and have been adopted in many socialist countries of the world. Sovkhoz was first introduced in Soviet Union on newly developed agricultural lands of western Silesia and Kazakhstan. In this system, the factors of production are owned by the State. Labour working on the farm are paid wages. The farm is managed on the principles of a factory. Farm machines are extensively used. Almost every agricultural operation from ploughing to harvesting is done by machines.

State farms have been established in some other countries also. After the revolution of 1974, all farms owned by the king or the nobles in Ethiopia were converted into state farms. The sugarcane farms of Matahara and Wanji, wheat farms of Ardaita, Goffai-Meda and Agarfa and cotton farm of Setit-Homaira are some examples of state farms there, which are known as Veland locally. In India, Suratgarh farm is an example of state farm.

EXERCISES

Review Questions

1. Answer the following questions briefly:

- (i) What are the main features of shifting cultivation?
- (ii) 'Dairy farming developed due to urbanisation', Explain with examples.
- (iii) Name the regions of the world where intensive subsistence agriculture is done. What are its main characteristics?
- (iv) How has the plantation agriculture developed? Discuss the new trends in plantation agriculture?
- (v) Why is the specialisation of crops essential in commercial farming ?

2. Compare the following:

- (i) Mixed farming and dairy farming
- (ii) Primitive subsistence and Intensive subsistence agriculture.
- (iii) Plantation agriculture and Horticulture.
- (iv) Kolkhoz and Sovkhoz.

3. Give reasons:

- (i) The future of shifting cultivation is bleak.
- (ii) The density of population is high in the regions of intensive subsistence agriculture where rice is the main crop.
- (iii) Extensive agriculture is generally done by machines.
- (iv) The success of dairy farming and truck farming depends upon the development of better means of transportation.

Cartographic work

4. Show the following on a world map:

- (i) Regions of shifting cultivation
- (ii) Dairy farming areas of Soviet Union.
- (iii) The regions of mixed farming
- (iv) Plantation agriculture regions.

Project work

5. Visit a farm in your neighbourhood and find out the following information. Discuss the findings and name the type of farming which is prevalent there.

- (i) Area of the farm.
- (ii) The crops which are grown.
- (iii) Cultivation methods and implements being used.
- (iv) Total cost in a crop season and income to the household.
- (v) The uses to which the crops are put to.

CHAPTER 8

Major Crops of the World

Crops are the main products of agriculture. Crops grown in any region present a distinct landscape, which is known as *cropping pattern*. Crops are generally described under different categories like cereals, pulses, oilseeds, cash or commercial crops and industrial crops. Such a classification of crops is not very rigid. For example, industrial crops provide raw materials to the agrobased industries. Hence jute, cotton and sugarcane were traditionally known as industrial crops but these days many crops are being used as raw materials in large scale mills e.g. wheat in flour-mills, oil seeds in oil-mills and ragi for making ragi malt.

Rice

Rice is mainly the crop of the monsoon lands in tropical regions. Rice is also grown in the river valleys and deltas of sub-tropical and temperate regions. It is the staple diet of about 50 percent of the population of the world. It requires warm and humid climate. Its plant requires flooded fields during the initial stages of its growth. During its growth period, the temperature should not fall below 27° to 30° celsius and rainfall should be about 100 cm. In areas of low rainfall, irrigation is necessary. Fields should be level so that water could stand there. On hilly terrain, rice is grown on terraced fields. Claye loam, which can retain water is best suited for rice cultivation. Rice is a labour intensive crop because most of

the operations have to be manually performed. Uprooting the seedling from nurseries, transplanting them in the flooded fields and removing weeds from time to time, have to be done manually.

There are two methods of cultivating rice. Seedlings are prepared in small nurseries. While the seedlings grow, the farmers prepare the fields. These are ploughed after removing the weeds and mixing the farm yard manures. With the arrival of the first shower, the water is impounded in the fields and by ploughing the soil is made muddy. The field is then levelled and seedlings are transplanted in the muddy ground. The water is allowed to stand in the field after the transplantation. In case the quantity of water decreases, it has to be supplemented by irrigation. Weeds also grow along with the plants which are regularly removed. High temperature and high humidity are responsible for the high incidence of diseases, insects and bacteria. In order to combat their attacks farmers use insecticides and pesticides. Harvesting is done manually as the small fields are not suitable for large machines. The grain is separated from the chaff either by beating it against the ground or with the help of small threshers.

In the highlands and dry areas, the cultivation methods are different. After preparing the fields by ploughing, mixing manures and insecticides, the seeds are sown by broadcast method. The rice plant grows with the help of rain water. Irriga-

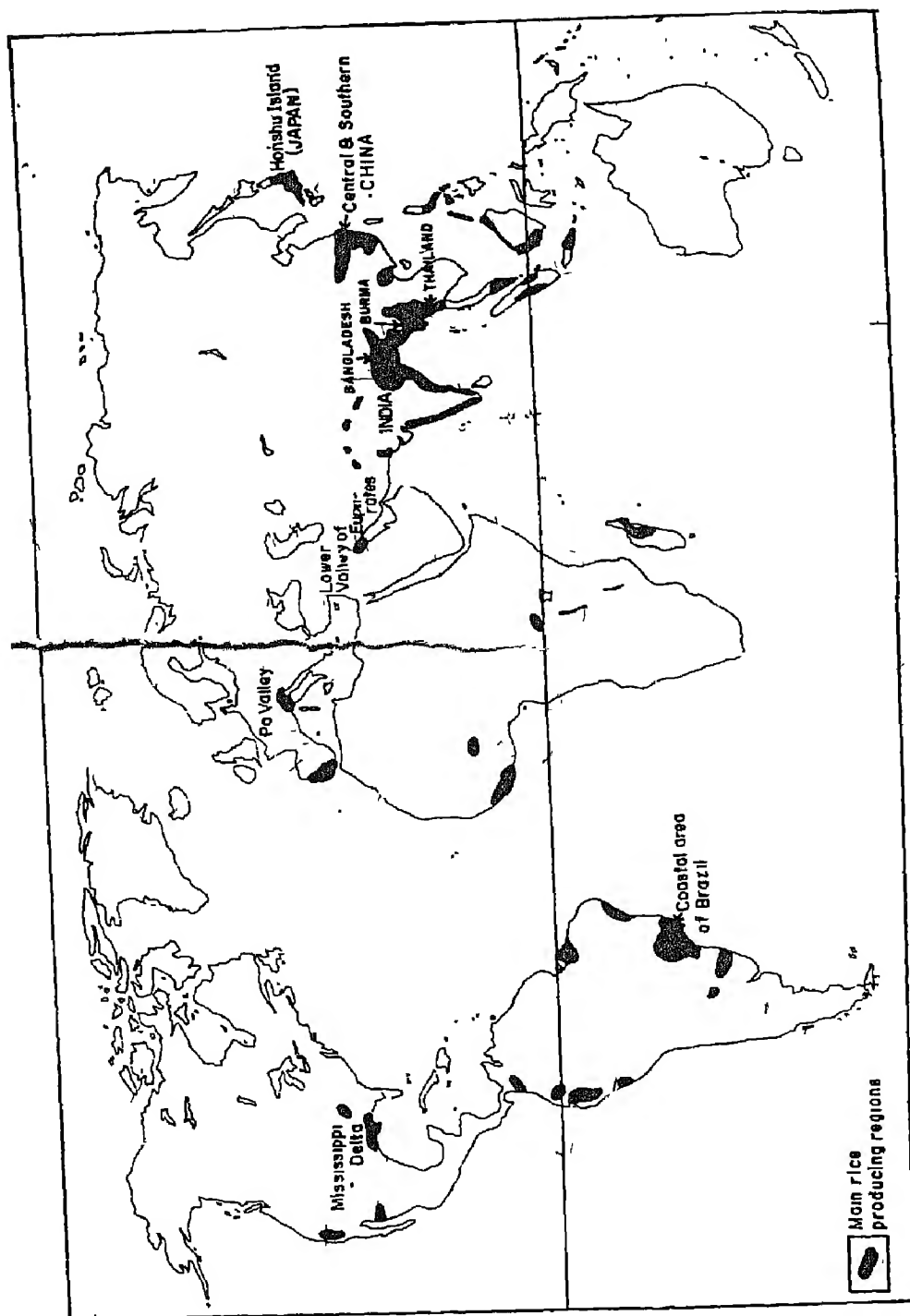


FIG. 8.1 World—Major rice producing areas

tion is provided after the rainy season is over. In this type of cultivation, yield of rice is lower than the transplanted rice.

Distribution of Rice

Rice is a crop of monsoon lands of Asia. In 1985, about 89.84 per cent of the total area under rice in the world was found in Asia. India, China, Japan, Indonesia, Thailand, Vietnam, Cambodia, Bangladesh, Malaysia are the major rice producing countries. Besides the countries of Monsoon Asia, a little rice is also produced in Egypt, Italy, Brazil, Turkey, United States of America, Spain

and France but their contribution to the total area under rice is insignificant.

The rice region of India is located in the areas of more than 100 cm of rainfall. The traditional rice growing areas of India are Assam, West Bengal, Bihar, eastern Uttar Pradesh, Kashmir valley, eastern Madhya Pradesh, Orissa, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka and coastal Maharashtra. Punjab, Haryana and western Uttar Pradesh have emerged as rice producers after 'green revolution' due to expansion in irrigation facilities. In Kashmir valley rice locally known as Shali is cultivated during summers. Three crops of rice i.e. Aus, Aman and Boro, are

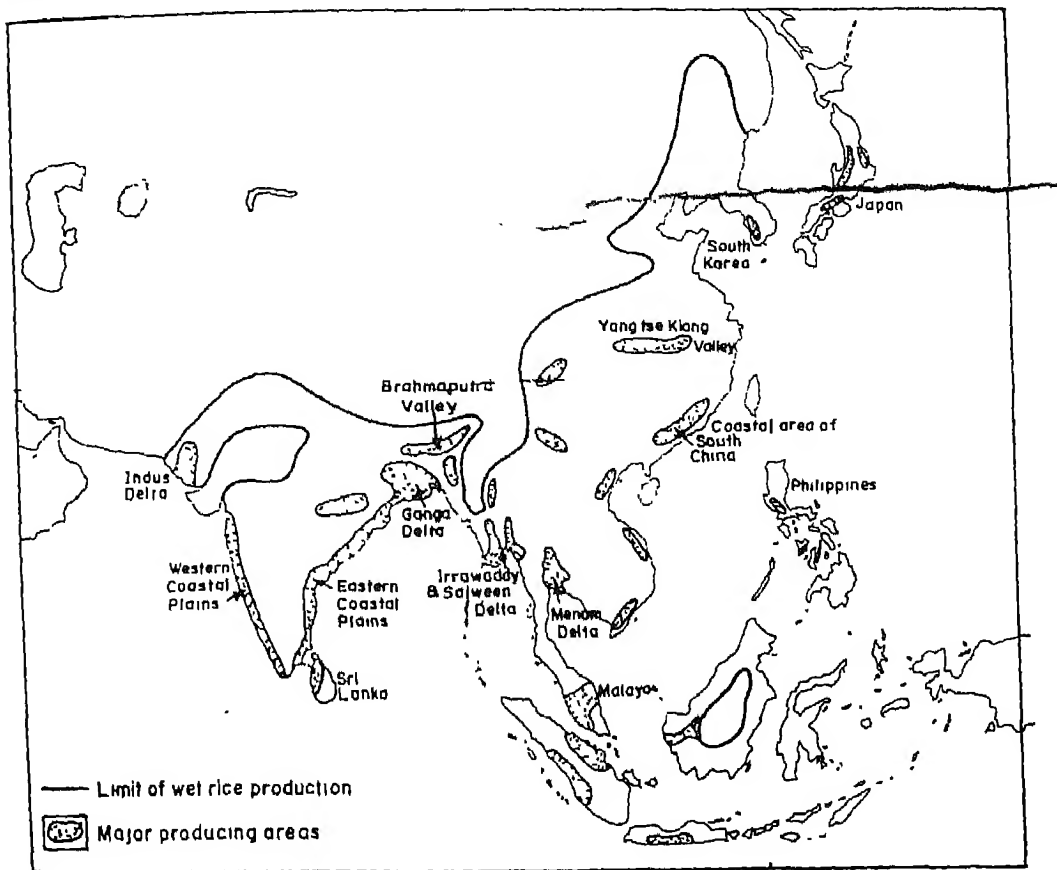


FIG. 8.2 World—Major areas of rice production in Monsoon Asia

grown in West Bengal. High quality basmati rice is grown in Dehradun and neighbouring areas. According to the 1985 data, the area under rice, in India was 4.2 crore hectares and its production was about 9.2 crore metric tonnes.

The northern limit of rice cultivation in China is demarcated by Quinlingshan mountain ranges and the river Huang Ho. Rice production is confined to the south of this line, while wheat and kaoliang are grown to its north. Yangtze Kiang, Sikiang and Sichuan are main rice producing areas of China. On hill slopes of southern China, rice is cultivated on terraced fields. In 1985, production of about 17.1 crore metric tonnes of rice was obtained from an area of 3.2 crore hectares.

About 50 percent of the total cultivated area in Japan is devoted to rice cultivation. High yielding varieties of rice have been developed here which give yields upto 6,220 kg per hectare. The varieties take 60 to 90 days to mature. Japan has very limited cultivable land, hence rice area is mostly confined to the coastal plains of Honshu, Kyushu and Shikoku islands. In the southern part of Japan two crops of rice are grown while only one crop is possible in north due to short growing seasons. Japan has introduced some mechanisation in rice cultivation. An integrated machine harvests crops, separates the grains from the chaff, cleans and packs them in bags and finally rolls the chaff in bales.

Indonesia accounts for 6.6 percent of the rice area in the world. Convectional rainfall and volcanic soil available on the islands present most favourable condition for rice cultivation. Due to fragmentation of land into many islands, there is lack of arable land and hence the rice is cultivated in terraced farms even on the hill slopes.

In Bangladesh, important factors for rice cultivation are alluvial soils brought by rivers and availability of water in rivers due to heavy rainfall. About 7.2 percent of the total rice area of the world is in Bangladesh but due to lower productivity it produces only 4.7 percent of the total world production.

Democratic Peoples Republic of Korea and Korea Republic are important not from the area point of view but because of very high productivity. Per hectare yield of rice recorded by Democratic Peoples Republic of Korea and Korea Republic in 1985 was 6,670 kg and 6,350 kg respectively. It is even higher than the yield of rice in Japan. Cultivation of rice outside monsoon Asia is not significant.

Trade

Most of the rice growing countries have high density of population. The demand for rice as a cereal is, therefore, high. Hence large quantities of rice do not enter into international trade. 65.8 percent of the total production of rice entered into international trade during 1981 but in 1985 it declined to 48.8 percent. This shows that the demand for rice in the producer countries is growing due to increase in population. Therefore, trade in rice is restricted. While several rice producing countries in monsoon Asia sell it for earning foreign exchange, others outside monsoon Asia export it due to lack of local demand.

Major rice exporters are Thailand, United States of America, China, Pakistan, Italy, Republic of Myanmar (Burma) and Egypt. Only a few countries in the world do not import rice. Some countries are exporters as well as importers. They export their low quality rice and import good quality rice from outside.

Keeping in view the growing trend of population, research in agricultural field both on national and international levels are being conducted to increase the production of foodgrains. International Rice Research Institute, Manila and National Rice Research Institute at Cuttack in India are engaged in conducting research on rice. Indian researchers have developed a number of improved rice varieties e.g. Jaya, Ratna, Prabhat, IR 20, IR 8, Padma, Kanchan, Bharat and Mangala.

Wheat

The staple diet of people in a large part of the world is wheat. It is generally believed that wheat originally came from temperate region. Wheat has great adaptability and hence it can be grown from Siberia to the tropical regions. It means that wheat has many varieties which can successfully grow in different climatic conditions.

There are two types of wheat crops according to the climate. Winter wheat is grown in those regions where winter is not very severe. Spring wheat is grown in those regions where winter is very severe and crop does not grow much due to low temperature.

Wheat can also be divided into two types on the basis of its quality i.e. soft and hard wheat. Soft wheat is grown in humid regions and hard wheat is grown in dry regions. Wheat is cultivated under intensive as well as extensive farming. Most of the wheat cultivated from a commercial point of view is produced in temperate grasslands under extensive farming.

Conditions for wheat cultivation do not impose any limitation for its areal extent because any such place where grass can grow is suitable for wheat. It is grown mostly in plains whether level or undulating, because large machines can easily be used. It requires 40 to 75 cm of rainfall. The weather at the time of germination should be cool and there should be sufficient moisture in the soil. At the time of ripening of the crop, there should be clear sky and an average temperature of 16° celsius. In the absence of sunshine crops may be infected and diseased. Loam is the most suitable soil for wheat. High yields of wheat is also obtained from the chernozem soils of Ukraine and prairies of United States of America. In the areas of low rainfall and high evapotranspiration irrigation is necessary. Overirrigation should be avoided as high humidity may cause a disease known as *red-rot*.

Distribution and Production of Wheat

Wheat cultivation is done over a large area in the world. There is hardly any country which does not grow some wheat. In 1985, wheat occupied an area of 23 crore hectares and its total production was 51 crore metric tonnes.

In 1985, wheat was grown over 5 crore hectares in Soviet Union. Ukraine is the main wheat growing region where wheat is produced. In Volga region and western Siberia, spring wheat is cultivated. Wheat is also grown in Kazakhstan. Due to long winter the northern part of Soviet Union has limited growing season. Wheat production has been fluctuating very much during past few years. Maximum production of 8.7 crore metric tonnes was obtained in 1982.

United States of America stands third in the world both in terms of area under wheat and its production. In 1985, a production of 6.6 crore metric tonnes of wheat was obtained from an area of 2.6 crore hectares. There are two wheat belts in United States of America. Firstly, spring wheat belt which extends between 36°N to 42°N. The soil is frozen during winter. In this region winter wheat cannot be grown. Farming in this region is highly mechanised. Secondly, winter wheat belt which extends from Kansas to Oklahoma running through eastern Colorado. In fact, Nebraska separates the winter wheat belt from spring wheat belt. The general agricultural landscape in both the belts does not differ much. Size of farms in winter wheat belt is smaller than the farms in the spring wheat belt. In winter wheat belt, emphasis is also laid on livestock farming. The largest milling centre of spring wheat belt is Minneapolis, while Kansas city, Topeka, Wichita and Oklahoma city are important milling centres of winter wheat belt.

Wheat region of China lies north of Qinling-shan and Huang Ho river. Winter wheat is grown in Huang Ho Basin, northern plains and Shandong peninsula. Hebei and Huanan provinces of Huang Ho basin are the leading wheat producers.

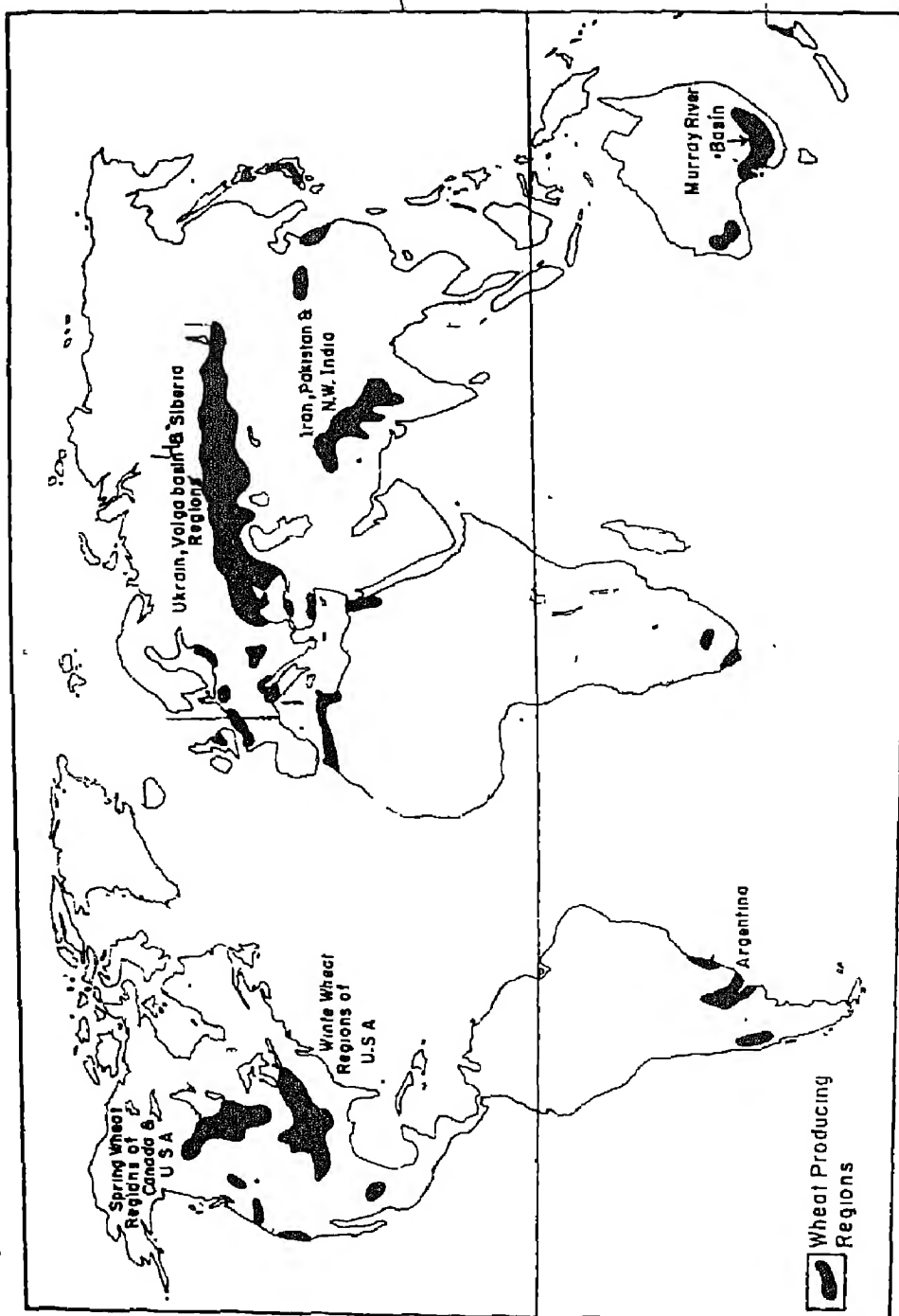


FIG. 8.3(a) World—Wheat producing regions

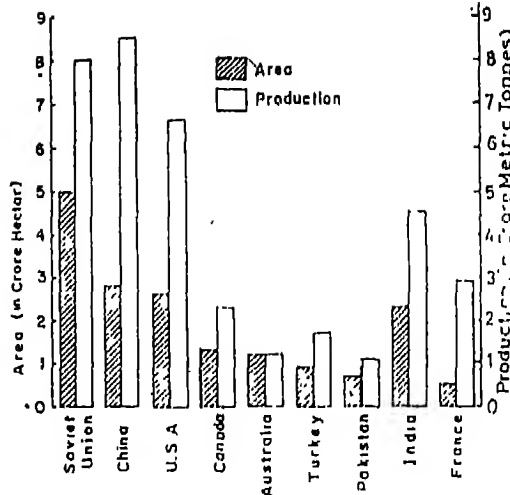


FIG. 8.3(b) Areas and production of wheat in some countries (1985)

The traditional wheat region of India lies in the alluvial plains formed by the tributaries of the Indus and the Ganga river systems. Punjab, Haryana, Western Uttar Pradesh and its contiguous areas are the major wheat producing regions. Wheat is also grown in Rajasthan, Gujarat, Madhya Pradesh, and Western Andhra Pradesh with the help of irrigation. Wheat production has increased substantially after the adoption of green revolution technology. Areas under wheat has been extended to some non-traditional regions like Bihar and West Bengal. The area under wheat in India in 1985 accounted for 10.3 percent of the total area and 8.7 percent of the total production in the world. The yield of wheat has increased from 1409 kg per hectare in 1977 to 1873 kg. per hectare in 1985.

The wheat region of Canada is confined to three states i.e. in the prairies Manitoba, Saskatchewan and Alberta, which together produce about 75 per cent of the total wheat production in Canada. Among these, Saskatchewan is the leading producer. Here mainly the spring wheat

is grown but in Ontario and Quebec provinces, winter wheat is also grown.

Australia is an important wheat producer as well as a leading wheat exporter country of the world. The temperate grasslands in the Murray-Darling basin where rainfall is between 40 and 50 cms form the major wheat region of Australia. Besides this, wheat is also produced in the adjoining areas of Adelaide and Perth as the Mediterranean climate provides suitable conditions for its growth. The wheat farming in Australia is of extensive type in which most of the operations are performed by machines.

Wheat is produced in every country of Europe but Mediterranean lands are most important. France is the leading wheat producer amongst the European countries. Spain, Italy, Yugoslavia, Romania, Hungary and Bulgaria are other important producers. German Democratic Republic and Federal Republic of Germany both are producers of wheat. Poland, Denmark, Netherlands and United Kingdom also produce wheat but they have limited area under wheat due to high density of population. As such intensive farming is practised. Except France, none of these countries export wheat because of large local demand.

Argentina is the leading wheat producer in South America. Its area has been extended in the Pampas grasslands. In 1985, Argentina had 53 lakh hectares of area under wheat and produced 85 lakh metric tonnes of wheat.

Trade

Wheat is an important item of international trade. There are more importers of wheat than exporter. In 1985, 105 crore metric tonnes of wheat was exported. Australia, Canada, United States of America, France, Italy, Argentina and Soviet Union are main exporting countries. They together contributed 88 percent of the total export in 1985.

The list of the importing countries is very long. Almost all the European countries are producers

as well as importers. West Asian countries are large importers of wheat. Brazil is the largest importer in South America.

Extensive researches are being done to obtain high yielding varieties of wheat. International Research Institutes have been established at Damascus and Mexico. In India, Agriculture Research Institutes and Agricultural Universities have done extensive researches in this direction.

Oil Seeds

Oil seed is the collective name given to a number of seeds from which edible oil is extracted. Different types of edible oils are used in different regions because of great regional variations in oil seeds. Main oil seeds are sesame, mustard and rape-seed, linseed, groundnut and coconut. Besides these the seeds of some other crops are also used as oil seeds e.g. cotton seed, maize, soyabean and sunflower. Olive oil is used in Mediterranean lands. Palm oil is obtained from palm.

Sesame is a crop of low rainfall areas. Its plant cannot tolerate too much of humidity, drought or cold. India is the largest producer of sesame. Sudan, China and Burma are other producers. These four countries together account for about 68 per cent of sesame production and 75 percent of its area. Egypt, Ethiopia and Tunisia are other African countries besides Sudan which produce sesame. In Asia, Turkey, Syria, Sri Lanka, Vietnam, Thailand, Bangladesh and Korea Republic are minor producers. Mexico is the largest producer in the America. China, Sudan, Mexico, Vietnam, Thailand and India are major exporters of sesame. China is the largest exporter and Japan is the largest importer of sesame in the world. Other importers of sesame are United States of America, Syria and Hongkong.

Mustard and rape-seed are the crops of tropical and sub tropical regions. It is mostly grown in China, India, Pakistan and Bangladesh. European countries, Canada and Soviet Union also grow it but the variety is different from the trop-

ical regions. Mustard and rape-seed require cooler climate with a rainfall of 25 to 40 centimetres. It successfully grows in loam and light loam soils. Irrigation is necessary in drier areas. China had the largest area under mustard in 1985. China, India, Canada and Poland together accounted for 81.3 percent of area and 69.6 percent of the production. Canada, Poland and China are main exporting countries while Netherlands, Italy, France, Federal Republic of Germany, United States of America, Morocco and Mexico are the main importing countries.

Linseed is cultivated for its seeds as well as flax. Traditional area of production is Asia and coastal areas of Mediterranean sea. Its oil is used in the preparation of paints, varnishes and linoleum and also as an edible oil. It is grown in tropical and temperate regions. India, Argentina, Soviet Union, United States of America, Canada, Pakistan and France are the leading producers of linseed. It is cultivated between 10° to 65° latitudes. It requires cool and humid climate with a rainfall of 45 to 75 centimetres. Alluvial and heavy clay soils are suitable for its cultivation.

In 1985, India contributed 30.71 percent of the total area of linseed in the world. Though, she occupied the first place in terms of area, Canada was the leading producer. The main exporting countries of linseed are Canada, France, Hungary, Ethiopia and Brazil while importing countries are United States of America, Czechoslovakia, Federal Republic of Germany and United Kingdom. Linseed oil has industrial value hence most of the importing countries are industrially developed which use it for industrial purposes.

Sunflower is believed to have its origin in southern United States and Mexico. It was brought to Spain in the mid-sixteenth century. It was cultivated as oilseed in Soviet Union during nineteenth century from where it spread to other parts of the world. Sunflower is grown for its oil. Being rich in protein its oil cake is used as cattle and poultry feed.

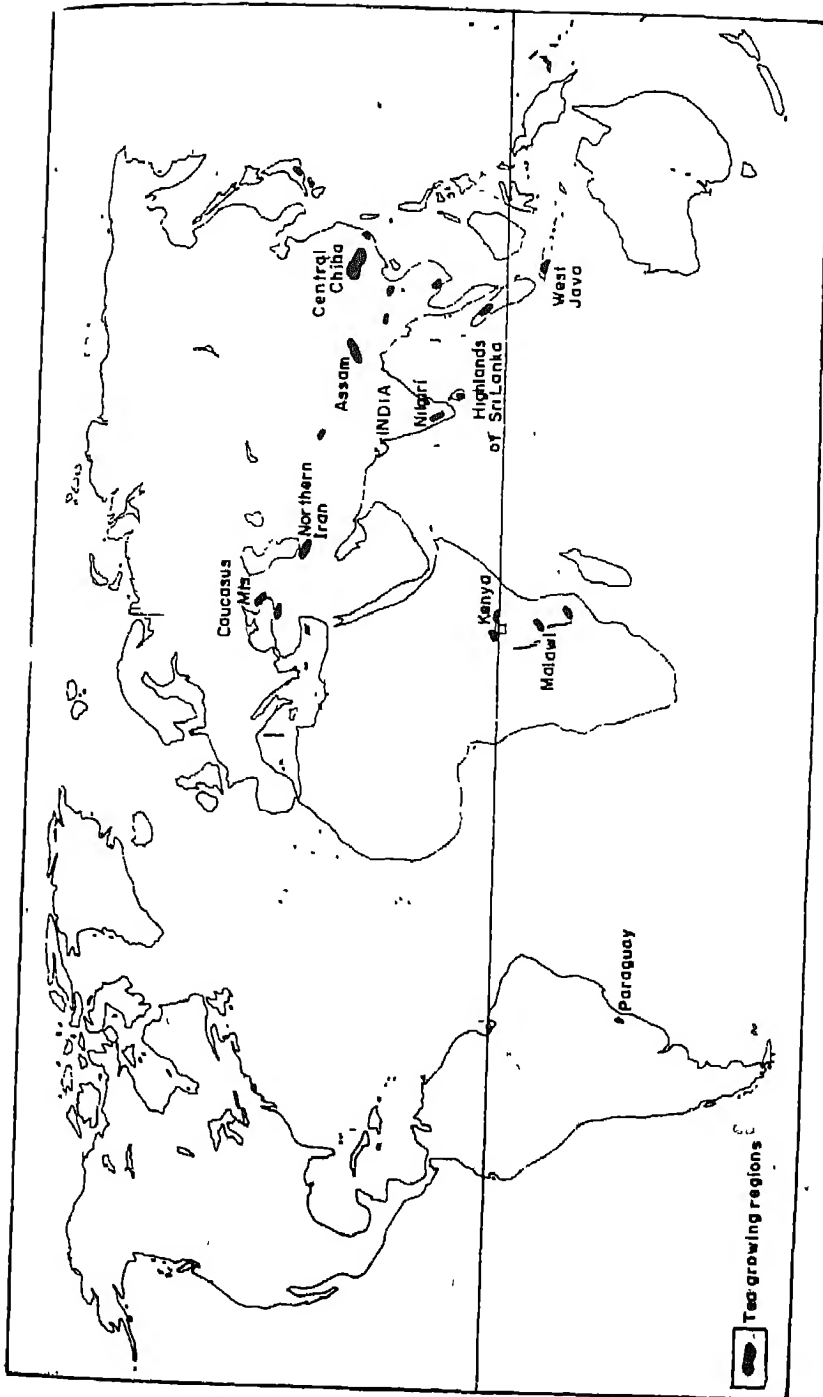


FIG 8.4 World—tea-growing regions

It requires cooler climate at the time of sowing, germination and at the time of its growth. A higher temperature and cloudless sky are required at the time of ripening. It can successfully grow in different types of soils but black soil is better suited. Its crop matures in three months.

Soviet Union, Argentina, Bulgaria, Romania, Turkey, Spain, USA, India and China are main producers of sunflower. Soviet Union is the leading country in both area and production. Argentina, France, Hungary, Australia and China are exporters of sunflower while Belgium and Netherlands are leading European importers. Mexico and USA are the other important importers.

Tea is an important beverage which is obtained from the tender leaves of an evergreen bush. Two types of tea plants are found: Chinese plant of small leaves and Assamese plant of wide leaves.

In many parts of the world, cultivation of tea was started as a plantation crop. Tea plant requires warm and humid climate. It thrives well in a region between 43° north to 27° south latitudes and may be planted up to an altitude of 2,450 metres above sea level. Evenly distributed rainfall is an important condition for its successful growth. It is generally grown in a zone having 125 to 750 cm rainfall. Water should not stagnate near the roots of the plants. Therefore, tea gardens are located on hill slopes. Its plant grows well in fertile soils with high humus content. The soils should not have alkali content rather acidic soils with low calcium and higher iron content are better suited.

Tea plantations are carefully planned. The vegetation is removed and hill-slopes are converted into terraces. These terraces reduce the chances of soil erosion. About 10,000 plants are accommodated in one hectare. Weeds are removed regularly so that the soil nutrients are not lost. Tea plants are grown under shade. In order to maintain soil fertility application of nitrogenous fertilisers is essential. For giving tea plants the shape of a bush, the main trunk of tea plant is cut down in the initial stage itself. The tea bush is not

allowed to grow beyond 40 to 50 cm. hence pruning is done every year during the rainy season. The total life span of tea plant is 40 to 50 years during which it can economically yield leaves. Its picking and processing are labour intensive activities and therefore availability of cheap labour is also an essential factor.

The major producers of tea are India, Sri Lanka, Bangladesh, Soviet Union, China, Japan, Indonesia, Argentina and Kenya. China occupies the first place in the world in terms of area while India is the leading producer. India is the largest exporter of tea in the world. Her contribution to the world tea export is 20.6 percent. Other important exporters are Sri Lanka, China and Kenya. Argentina exports about 3.7 percent of the total tea export in the world. United Kingdom, United States of America and Soviet Union are the major importers. Other important importing countries are Pakistan, Iraq, Iran and Egypt. The above mentioned seven countries are responsible for 69.2 percent of the total tea imports in the world.

Coffee

Coffee like tea is a plantation crop and one of the widely used beverages. It is a plant of highlands in the tropics and successfully grown between 500 to 1500 metres above the sea level. There is controversy about the area of its origin. Some people believe that coffee is the native plant of Keffa in Ethiopia but some people hold the view that the place of its origin is Nocha (Mokka) in Yemen. It is believed that coffee plant was brought to Mokka from plateaus of eastern Africa and where coffee Arabica developed. From here it spread to south and south east Asia. India, Sri Lanka and Java got coffee from Yemen. After fungus attack in 1880 all plantations in Java and Sri Lanka were destroyed. Coffee plantation was then introduced in South and Central America.

Coffee is the berry of a bush. Though several

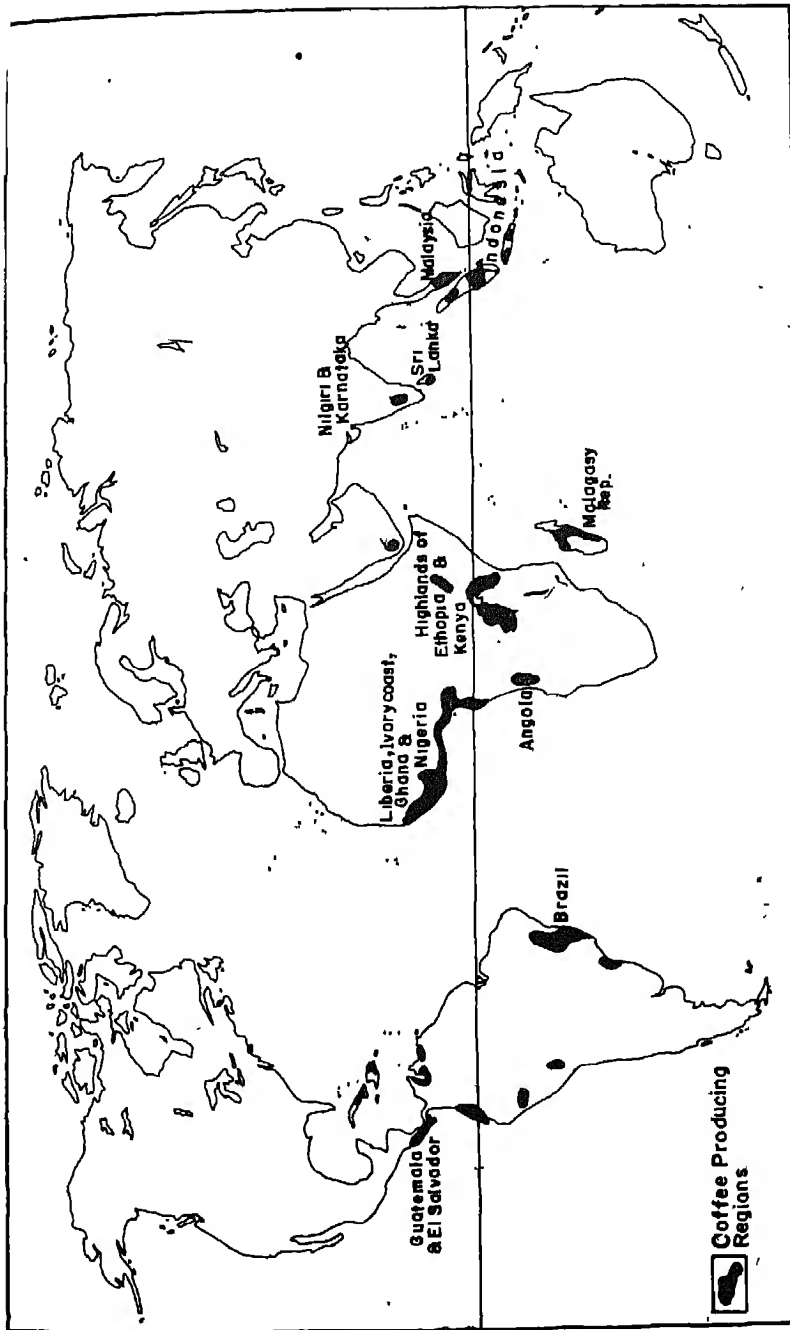


FIG. 8.5(a) World-Coffee producing regions

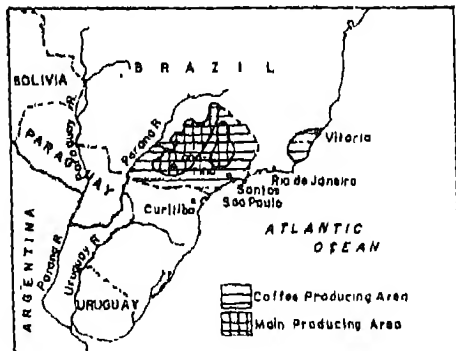


FIG. 8.5(b) Brazil—Coffee producing areas

kinds of bushes are included in this species, two varieties i.e. coffee arabica and coffee robusta are grown mainly for coffee. Coffee liberia originally came from Liberia. It is grown in some African countries. Coffee arabica requires temperature of 15° to 20° celsius while coffee robusta requires a little higher temperature i.e. 20° to 30° celsius. Coffee plant is very susceptible to frost and cannot tolerate it. Hence it is grown under shady trees. It thrives better under high humidity conditions hence relative humidity varying between 70 and 90 percent and rainfall between 160 and 250 cms. are good for it. Generally coffee grows in deep, porous and water retentive soils with high humus content. Hail is very harmful to coffee plants. High velocity wind also damages the coffee bush.

Brazil is the largest producer of coffee. It is also grown on the hilly slopes of Colombia, Venezuela, Guatemala, Haiti, Jamaica, and Puerto Rico.

Ideal conditions for the coffee growth are found in the hinterland of Rio-de-Janeiro. It is grown upto a height of 900 metres on the west-

ern slopes of the plateau of Brazil. Large coffee plantations in Brazil are known as 'fazenda'. These fazendas were planted at a greater height i.e. 1000 metres above sea level. Brazil occupies first place both in terms of area and production of coffee in the world. In India, Karnataka is the largest coffee producing state. In Indonesia, most of the coffee plantations have been developed in Java island.

Trade

The main coffee exporting countries are Brazil, Colombia, Indonesia, Ivory Cost, Guatemala, Uganda, Ethiopia, El-Salvador and Mexico. Major importing countries are United States of America, Federal Republic of Germany, France, Belgium, Italy, United Kingdom, Japan, Argentina and Soviet Union. Brazil accounts for about one fourth of the coffee export while United States of America accounts for about one fourth of its imports. Ivory Coast and Uganda in Africa, and Indonesia in Asia are other important exporters of coffee.

European countries are major importers of coffee besides United States of America. Federal Republic of Germany, France, Italy, Netherlands, Spain, Belgium and United Kingdom together account for 39.9 percent of the total coffee imports in the world

Sugarcane

Sugarcane is a tropical crop which seems to have its original home in eastern and south eastern Asia. Sugarcane was introduced to Europe by the Arab traders who brought it first to Egypt and then to Sicily and southern Spain. It was taken to the Atlantic Islands of Canaries and Madeira. From these islands sugarcane was taken to Brazil and West Indies. It was introduced to Africa and Australia at a such later stage. Sugarcane is the major source of sugar. Therefore, it is an important industrial crop in some regions.

Sugarcane requires constantly high temperature ranging between 21° and 27° celsius. Less than 20° celsius temperature restricts the growth of sugarcane. Frost is extremely harmful to this crop. It requires 75 cm to 120 cm of rainfall. Hence, the hot and humid climate of tropical region is very good for sugarcane cultivation. Irrigation is required in the areas of low rainfall. At the time of ripening, low temperature and dry weather helps in enhancing the sucrose content in the crop.

Loam, clay and alluvial soils are suitable for sugarcane. In some areas, it is grown on black and laterite soils too. Deep soil with higher moisture retention capacity is the best suited soil. Application of compost manures and chemical fertilisers is absolutely necessary for maintaining soil fertility. Cheap labour in large number is required in those regions where the level of mechanisation in sugarcane cultivation is low. Once planted, crop can give yield for atleast three years.

Brazil occupied the first place in the world both in area and production of sugarcane. She accounts for about 25 percent of its area as well as the production. India occupied the second place. Other important producers are Cuba, Pakistan, China, Thailand, Mexico, Australia and Indonesia.

In India, two distinct sugarcane growing belts exist. One lies in the north and the other in the south. Uttar Pradesh is the main sugarcane producer in the north and Tamil Nadu in the south. The sugarcane cooperatives in Maharashtra have promoted its cultivation. Besides these, it is cultivated in Andhra Pradesh, Bihar and West Bengal.

Before the Cuban revolution of 1959, there were large sugarcane plantations in Cuba, owned by foreigners as well as local capitalists. These plantations were known as 'Latifundios'. After 1959, these 'Latifundios' were nationalised. Now the sugarcane cultivation in Cuba is highly mechanised.

Queensland and the coastal plains of north New South Wales are important sugarcane cultivating regions in Australia. Java island is the leading producer amongst the Indonesian Islands.

Trade

Sugarcane loses its weight upto ten times in the process of manufacturing sugar. Therefore, sugar mills are located in the sugarcane producing regions.

Cuba is the largest exporter of cane-sugar. She accounts for 24.0 percent of the total sugar export in the world. Other exporting countries are Venezuela, Brazil, Australia, Thailand, South Africa, Dominican Republic, Philippines, Mauritius and India. Though India is a large producer of cane-sugar, there is a very large home demand and therefore, her export is limited. Guatemala, Honduras and Jamaica in Central America also export sugar.

The list of the sugarcane importing countries is very long. Most of the countries of Africa, Europe and North America import sugar. Some developed countries import sugar, refine it and export it at higher prices.

Sugarbeet

Sugarbeet is a root crop which is used for making sugar. It is a crop of temperate regions. Its cultivation was virtually confined to Europe. In the middle of the eighteenth century, the technology for extracting sugar from beets was discovered in Germany. After this, the area under sugarbeet expanded in Europe. Now it is cultivated in Europe, Western Soviet Union, United States of America and Canada. It has also spread to the countries of West Asia such as Syria, Iraq, Turkey, Israel and also to Algeria in Africa.

Sugarbeet takes about 5 to 6 months to mature. During this period, the temperature should be between 16° to 23° celsius. It requires high moisture, hence if there is less than 60 cms of rainfall

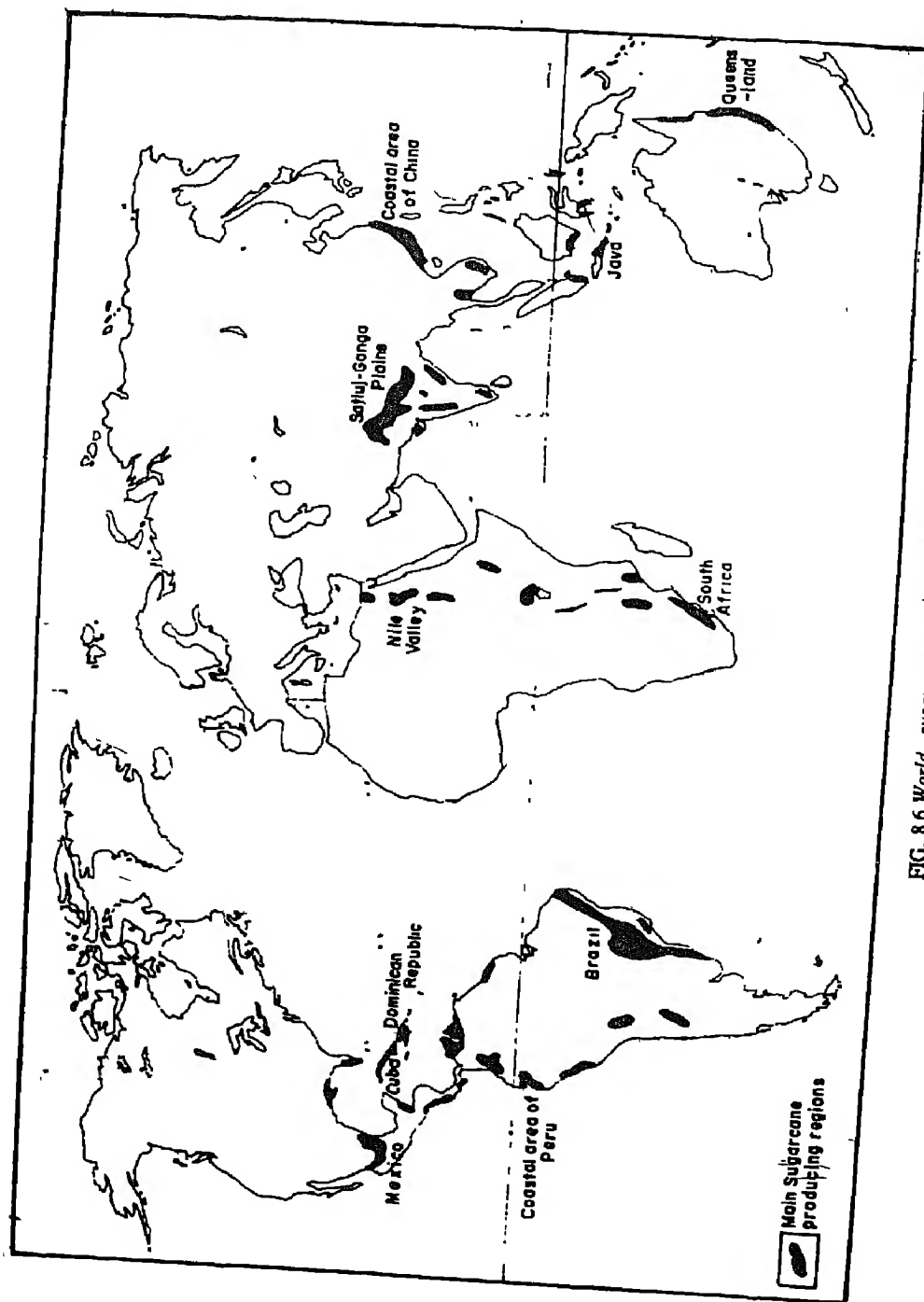


FIG. 8.6 World—sugar-cane producing regions

irrigation is necessary. At the time of maturity, cool climate with clear, cloudless sky ensures higher sugar content. It thrives well in loams and clayey loams. It can grow on alkaline and saline soils but saline soils are more harmful to the crop. Sugarbeet cannot survive on water logged soils. It is highly susceptible to diseases and infections. Therefore, scientific crop rotation is adopted to combat these diseases. For example, sugarbeet-hay and wheat-cum-sugarbeet are recommended crop rotations. It is fertiliser intensive crop and requires nitrogenous fertiliser. It is recommended to use 120 kg nitrogenous fertilisers per hectare to maintain the fertility status of the soil.

Sugarbeet is extensively grown in the north European plains, particularly in France, GDR, FRG, Poland, Czechoslovakia and Soviet Union. In United States of America sugarbeet is grown with the help of irrigation in California, Colorado and Utah. United Kingdom, Romania and Italy lie outside the north European plain where sugarbeet is cultivated.

Soviet Union is the largest producer of sugarbeet which contributes about 39.18 percent of the sugarbeet area and 29.0 percent of its production in the world. Except for United States of America, China and Turkey, all other producers are European countries. Generally sugarbeet producing countries also manufacture sugar from beet and consume it locally. Very limited quantity of beet sugar therefore, enters the international trade.

Cotton

Cotton is one of the most important vegetal products from which industrial fibres are obtained. Cotton is an ancient crop in India and Egypt. After the discovery of the cotton gining machine in 1793, there was a revolutionary change in the production and utilisation of cotton. The quality of cotton is decided on the basis of the length of its staples. Long staple cotton is supposed to be of high quality and is used for making superfine cloth. On the basis of the length of the staple,

cotton is divided into different varieties. The best quality of cotton has the staple length of more than 5 centimetres. This type is grown on the south eastern coast of United States of America, Puerto Rico, and other islands of West Indies. It is also known as Sea-island cotton or long staple cotton. In the medium staple cotton, the length of the staple varies between 3.75 to 5 centimetres. It is produced in Nile basin, Soviet Central Asia and United States of America. It is also known as Egyptian cotton. The upland American cotton has its staple length between 2.5 to 3.75 centimetres. It is produced in Mexico and Central America. Small staple cotton is produced in India and Brazil. The length of the staple is less than 2.5 cms.

Cotton requires warm climate but temperature between 21° and 27° celsius is ideal during the period of its growth. Cotton plant can tolerate as high temperature as 40° celsius but it should not be lower than 21° celsius. This plant cannot tolerate frost that is why it can grow in those areas of subtropical region where a growing season of 210 frost free days are available. When fruits start appearing, range of temperature should be high during day and low during night to ensure healthy fruits in the plant.

Cotton essentially is a plant of dry climate. A rainfall of 50 cms is enough, but it should be evenly distributed during the entire growth period. Irrigation is required in the areas of low rainfall. The sky should be cloudless at the time of the ripening of the cotton balls. Rain, at this time is very harmful.

Cotton plant can grow on a variety of soils with good drainage. Water logged soil is not suitable for cotton. Volcanic, black and alluvial soils are most suitable for it. Cotton plant requires intensive fertiliser use.

Distribution and Production of Cotton

Cotton is a tropical raw material. Its demand

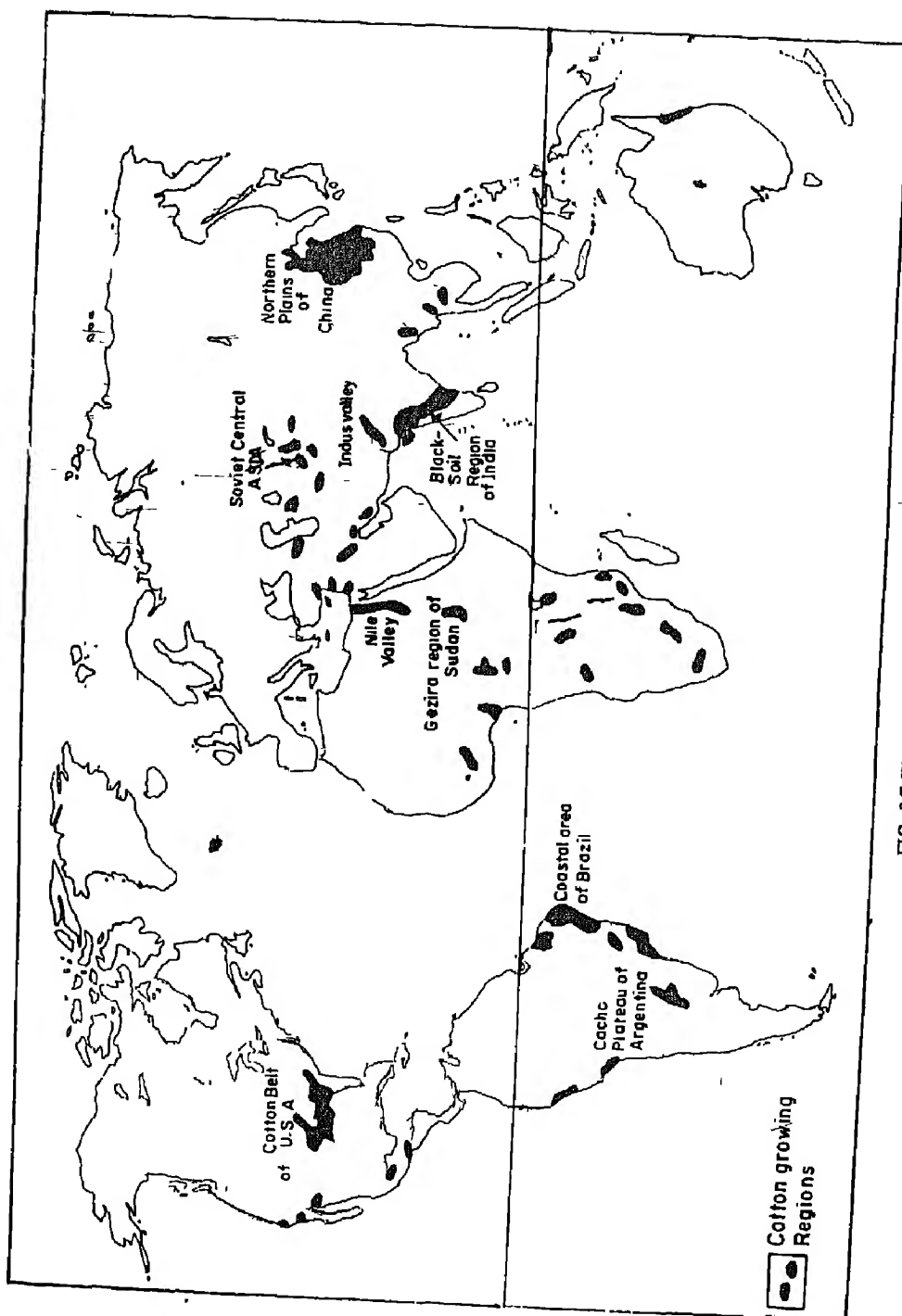


FIG. 8.7 World—Cotton growing region

increased fast after industrial revolution. Among the colonial powers, Britain developed its cultivation in her colonies particularly in India, Sudan and Egypt. This strategy was adopted in response to the demand of cotton in the textile industries of Liverpool and Manchester. After the mechanisation of the weaving and spinning processes the demand for cotton went on increasing. United States of America remained a major cotton producer for a long time.

Cotton is grown in the cotton belt of United States of America, which is located in its southern part. The northern limit of this belt is determined by 210 frost free days and 25° celsius summer isotherm. North Western Uplands of Texas, Mississippi Valley, central Tennessee valley and the Atlantic coastal plains are the main cotton producing regions.

In China, cotton is produced in north China plain, Wei Ho Valley and lower Yangtze Valley. The major cotton producing region of Soviet Union lies in the Soviet Central Asia comprising of Tadjik, Kazakh, Turkmen and Uzbek S.S. Republics. The dry steppe lands have been converted into cotton growing areas with the help of irrigation. In India, cotton is produced in the black soil region. Maharashtra, Gujarat, Karnataka, Tamil Nadu, Madhya Pradesh, Andhra Pradesh are major producers. Cotton has become an important crop in Punjab, Haryana and in some parts of Rajasthan.

Sao Paulo in Brazil is an important cotton producing area. Nile Delta in Egypt produces good quality Egyptian cotton. The cotton region of Sudan lies on Jazira and in the irrigated parts of White Nile Basin. In Pakistan, good quality cotton is produced in Indus Valley due to availability of irrigation facilities.

The importance of cotton as an industrial crop in the international market cannot be challenged. Major exporting countries are United States of America, Brazil, Mexico, Egypt, Sudan, Uganda, Pakistan, India and Turkey. United Kingdom, Japan, France, Federal Republic of Germany and

Italy are main cotton importing countries. After the second world war the area under cotton has witnessed an increase in African countries like Uganda, Nigeria, Tanzania and also in South American countries like Argentina and Peru. Hence, some new exporting countries have emerged with substantial contribution to the cotton exports.

Rubber

Rubber is latex of a tree widely found in the tropical forests of Amazon and Zaïre basins. It was first used to erase the pencil marks and hence was called rubber. It was collected from the forests but now it has become a versatile product with multifarious uses. Elasticity, resistance to water and electrical non-conductivity are its invaluable properties which have made it indispensable in modern life.

Rubber plant was found wild in Amazon basin. The latex of this tree was used by the local natives for water proofing their shoes. The local people called the latex as 'Cahuchu' (tears of the tree). In 1844, Goodyear in United States of America and Hancock in Britain discovered the method of vulcanisation and after that it became more useful industrially. But its demand upto 1890 was so small that it was met from the gathering in the Amazon forests. The invention of motor car and the development of electric power in which rubber was used for insulation, led to an increasing demand for rubber. The invention of pneumatic tyres in motor car by Dunlop further increased its demand.

The rubber obtained through gathering in the Amazonian forests became inadequate to meet the increasing demand. Hence, the European colonial powers started rubber plantation in their colonies. The British started rubber plantations in Malaya and Sri Lanka and the Dutch developed these plantations in Indonesia. Rubber plantations were also introduced in Sarawak, Zaïre, Western African countries and Indo-Chinese

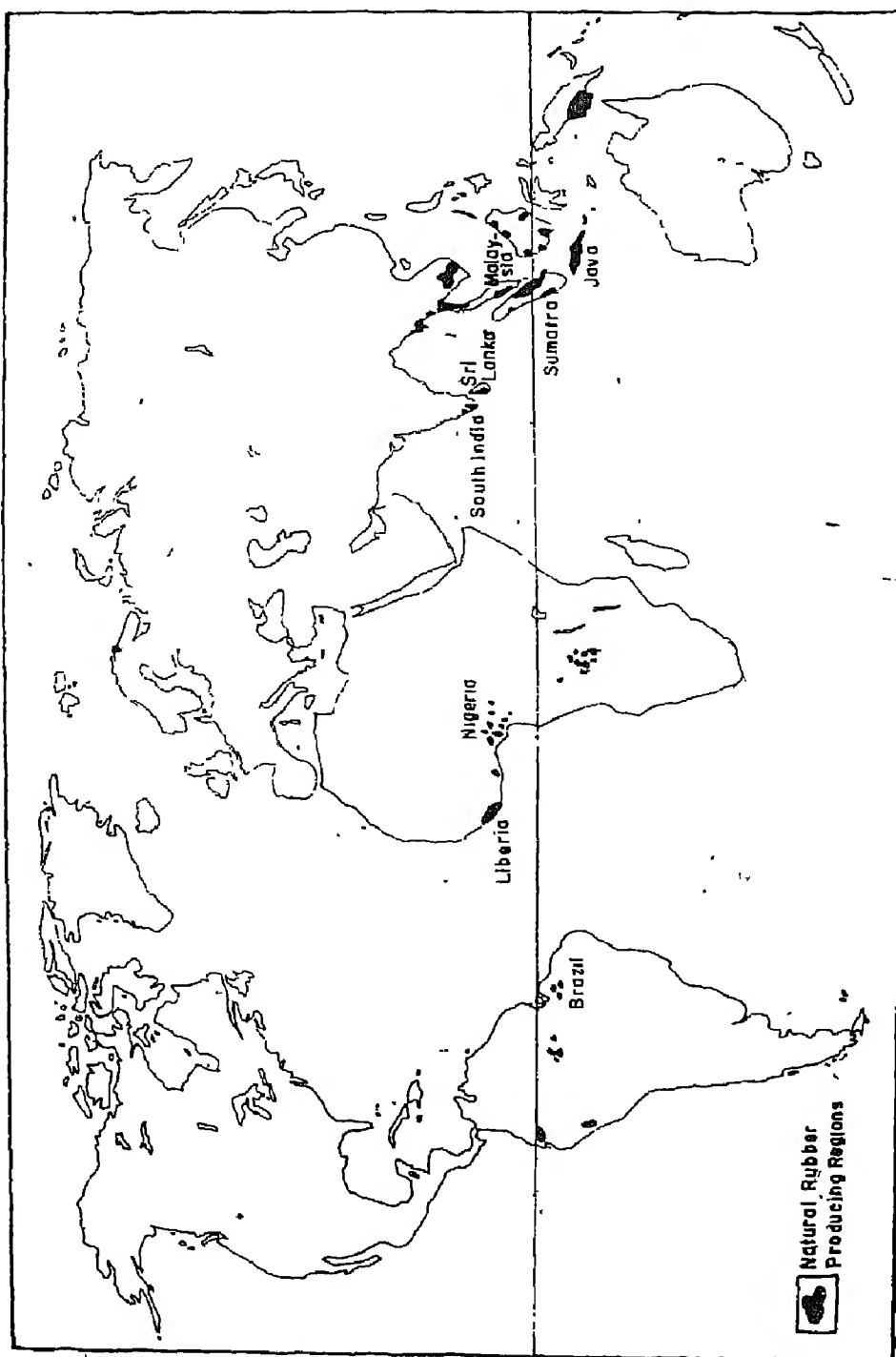


FIG 8.8 World—Natural rubber producing regions

peninsula.

Equatorial climate is best suited for rubber plant. It requires high temperature of about 27° celcius and rainfall of 150 cms evenly distributed throughout the year. Its plantations are generally located on undulating or gently sloping highlands so that the water is drained efficiently. Deep fertile soils are best suited but it successfully grows on a variety of soils in Malaysia.

Rubber has become a product of southeast Asia. Malaysia is the main producer of rubber. Indonesia occupies the second rank. Thailand, India, China, Sri Lanka and Kenya are other important producers. Cambodia, Vietnam, Cameroon, Nigeria, Zaïre and Brazil are minor producers of rubber. Malaysia, Indonesia and Thailand together produce more than 75 percent of the total rubber production of the world.

The rubber plantations in Malaysia are located on the coastal plains and the hill slopes of the interior. Java and Sumatra have most of the rubber plantations in Indonesia. Kerala, Tamil Nadu and Karnataka are the main rubber producing states in India. The main exporters of natural rubber are Malaysia, Indonesia, Thailand, Sri Lanka, Liberia, Vietnam and Nigeria. Malaysia, Indonesia and Thailand account for about 87.38 percent of export of rubber. United States of America is the leading importer. Japan, China,

Soviet Union and France are other importing countries. There is a positive correlation between the level of industrial development and import of natural rubber.

Synthetic Rubber X

The natural rubber is facing stiff competition from synthetic rubber. Natural rubber supplies to United States of America and Germany were discontinued during the Second World War. It provided stimulation for conducting research to obtain synthetic substitute. Synthetic rubber is made of certain kinds of hydrocarbons. Of these, butadiene is the most important. These hydrocarbons are obtained from coals, crude petroleum and alcohol.

Synthetic rubber witnessed great strides and by the end of the second world war the combined output of synthetic rubber of Germany and United States of America was almost equal to the output of the natural rubber. Synthetic rubber is more oil resistant than natural rubber but it is costlier to produce. The raw material of synthetic rubber is obtained from mineral oil and oil crisis hinders its supply. The process to obtain hydrocarbon from coal is very costly. But it is true that tropical natural rubber has to face severe competition from temperate synthetic rubber.

EXERCISES

Review Questions

1. Answer the following questions briefly.

- (i) Discuss the geographical conditions for the growth of rice and describe its distribution pattern in the world.
- (ii) Which geographical conditions are necessary for the growth of wheat? Discuss its distribution pattern.
- (iii) Discuss the distribution pattern of tea and coffee in the world.
- (iv) Describe the geographical distribution of cotton and rubber with examples.
- (v) 'Most of the sugarcane producing countries lie in the tropics.' Elaborate this statement in the background of the geographical conditions for its growth.

- (vi) Write a note on the distribution of sugarbeet as a temperate crop.
2. Give reasons:
- Rice cultivation is labour intensive
 - Very small proportion of rice production is available for international trade.
 - Tea is grown on hill slopes.
 - Coffee bush is planted under shady trees.
 - Cotton crop does not require rainfall at the time of ripening.
 - The importance of natural rubber has been declining.

Cartographic Work

3. Represent the following data with the help of a suitable diagram and answer the following after examining it.
- What is the yield of sugarbeet in different countries?
 - Why are most of the beet producing countries located in temperate region?

Area and Production of Sugarbeet in the world, 1985

Country	Area (in 100 hectares)	Percentage of world area	Production (in 1000 metric tonnes)	Percentage of the world production
Soviet Union	3425	39.2	82,000	29.0
China	580	6.6	8,091	2.9
France	490	5.6	28,476	10.0
USA	446	5.1	20,553	7.3
Poland	443	5.0	14,700	5.2
F.R. Germany	403	4.6	20,750	7.3
Turkey	323	3.7	10,000	3.5
Romania	310	3.5	6,646	2.3
World	8,740	100.0	2,82,925	100.0

4. Represent the following data with the help of bar diagram and compare different countries from the view of area, production and yield of rice

Area, Production and Yield of Rice in the World, 1985.

Country	Area (in 1000 hectares)	Percentage of World area	Production (in 1000 metric tonnes)	Percentage of world production	Productivity yield (Kg/Hec)
China	32,075	22.17	171,479	36.8	5.350
India	42,000	29.03	91,509	19.64	2.180
Japan	2,342	1.6	14,578	3.12	6.220
D.P.K. Korea	840	0.5	6,600	1.2	6.670

<i>Country</i>	<i>Area (in '000 hectares)</i>	<i>Percentage of World area</i>	<i>Production (in '000 metric tonnes)</i>	<i>Percentage of world production</i>	<i>Productivity yield (Kg/Hec)</i>
Korea R	1 237	0.85	7.855	1.7	6 350
Thailand	9 585	6.6	19.521	4.2	2.046
Indonesia	9 540	6.59	38 660	8.3	4 052
Bangladesh	10 430	7.20	21.900	4.7	2100
Philippines	3.402	2.4	8 300	1.8	2 440
Burma	4 800	3.3	15 400	3.3	3.208
Brazil	4.752	3.28	9 019	1.9	1 897
World	144,674	100.0	465,970	100.0	3 220

- 5 Show the distribution of the following crops on the world map:
Rice, wheat, tea, coffee, cotton, sugarcane and rubber

CHAPTER 9

Manufacturing Industries

THE term 'manufacture' literally means 'to make by hand' but it has wider connotation. When the early man broke the stones, sharpened its edges and made a tool to hunt, it was the first step in the history of manufacturing. In the modern times manufacturing is largely done by machines. Manufacturing is a process in which some materials are transformed in such a way that they become more useful and valuable. For example, iron ore is used as a raw material in manufacturing iron and steel, which in turn is further transformed into machines and tools. One of the principles of manufacturing industry is that 'the more a material is changed in its form, it will be of a greater value and utility.'

In initial stages of its development manufacturing was done by craftsmen. Craftsmen used to weave cloth and make tools of iron and wood. The scale of their production was small. Industrial revolution was the most important event in the history of industries which started during the seventh and eighth decade of the eighteenth century. As a result, a lot of changes in industrial process and management took place. These changes were perceived in terms of the use of machines in place of hand, switch over in methods of production i.e. from household to a factory, and concentration of activity at one place rather being scattered over a large area. A new relationship among human beings, machines and resources emerged. New technology based on

coal and steam replaced the old technology based on wood, flowing water and wind energy. Industrial revolution started in United Kingdom but soon whole Europe came under its influence. The increased demand of raw materials in Europe generated by the industrial revolution gave rise to colonialism. With the development of navigational skills European countries rushed to tropical regions for getting hold of tropical raw materials and thus many tropical countries became colonies.

The modern manufacturing compared to that of hundred years ago, has become too complex. The interests of international and multinational corporations are much more extensive and the whole world is under their influence. The industrial products have been diversified and the market is broad-based. Today industries can be classified in many ways,

Classification Based on the Size

The size of an industry is decided by the investment of capital, number of labour employed and the quantum of production. On the basis of the size, industries can be classified into *household* or *cottage*, *small scale* and *large scale*.

Household industries are the basis of modern manufacturing industry. The craftsmen with the help of their family members make goods within their homes. They acquire such skills from their parents. They use these goods for their self con-

sumption and the surplus is marketed mostly locally. Thus, potters, carpenters, blacksmiths, weavers and boat makers earn their livelihood from their respective occupations.

The main characteristics of household or cottage industries are as follows. They utilise local raw materials. The products are mainly for the local markets. The scale of operation is small. Production is done by the family members collectively with the help of ordinary tools and equipments. In rural areas, some farmers produce goods like ropes, baskets, clothes during the slack period when there is no agricultural work. Items produced in the household sectors are still very important in many countries of Asia and Africa. Even household industries have now adopted some of the improved and more efficient tools in their production process.

The introduction of machines in the production process differentiates the small scale industry from cottage or household industry. In fact, the expansion in the scale of production in the household industry provided the base for the small scale industries. In household industry craftsman is the designer, producer as well as trader but small scale industry is supported by small machines which are power driven. Labour is also employed. If the raw material is not available locally, it is obtained from outside. Its products are sold in the market through traders. Utilisation of energy for running machines is a special feature of this sector. The small scale industries have laid the foundation of industrialisation in countries of ancient civilisations such as India, China, Egypt and Ethiopia. In some of these countries, such as India in spite of industrialisation, small scale industries continue to be important. They play crucial role in providing employment to a large population of developing countries. Clothes, paper goods, toys, earthenwares, furniture, electrical goods, electronics, metallic utensils, edible oil and leather industry are examples of small scale industries.

Large scale industries use power driven heavy

machines in the production process. In some factories, thousands of labours are employed. Large amount of capital is invested in the establishment of such industries. The management of such large industries is also complex as it is hierarchically divided amongst owners, managers and labour. Special measures are taken for quality control. Production specialisation is another feature of large scale industry. The raw material in these industries is procured from far off places and the finished product is also sent to distant markets and in certain cases even to foreign markets. It has been possible due to development of cheap means of transportation and their capacity. Modern iron and steel industry, aviation and ship building industry, textiles and petrochemical industries are some of the examples of large scale industries.

Classification on the Basis of the Nature of Products

There are some industries which produce raw materials for other industries and are called *basic industries*. For example, iron and steel industry is known as basic industry because its products are used in manufacturing machines, which in turn, are used to produce other types of products. Thus, the iron and steel after their production are not consumed completely but contribute in furthering the production process. The forward and backward linkages of such industries are clear and unambiguous. Iron ore mining is the backward link of iron and steel industry while manufacturing of machines to be used in textile or chemical industry is its forward link.

There are some industries which produce goods for final consumption e.g. edible oil, tea, coffee, bread, biscuits, radio, television, etc. They are called *consumer goods industries*. These are different from the products of basic industries.

The nature of the products in different industries depends upon the type of raw materials used in them. Hence, the industries are also classified

on the basis of the nature of the raw materials used in the manufacturing.

Some of the industries utilise the agricultural products as raw materials, for example, jute, tea, sugar, cotton and vegetable oil industries etc. They are called *agro-based industries*.

There are a number of forest products which are used as raw materials in industries. For example, paper and pulp industry, rayon, terpentine oil and furniture industry are based on the raw materials obtained from the forests and hence known as *forest-based industries*.

The modern industries owe their development to *metallic industries*. These are further classified in two groups; non-ferrous and ferrous industries.

Industries based on such metals, which do not have iron content e.g. copper, aluminium etc. are called *non-ferrous industries*. Industries based on metals having iron content is known as *ferrous industries*. For example, iron and steel industry, machine and tools, motor cars, railway engines, agricultural tools industries, etc.

Industries based on chemicals are termed *chemical industries*. Chemicals are used widely such as in agriculture, metallic industry, textiles, leather, paper, glass, ceramics, soap and food processing industries. Hence, it is a very important industry. Some of the chemical products e.g. salt, sulphur, potash, limestone, coal and petroleum are obtained as minerals and some are obtained as secondary products. Chemical industry is responsible for the development of modern petro-chemical industry based on petroleum as raw material. Chemical fertilisers, paints and varnishes, plastic and some of the medicines are the products of petro-chemical industry.

Classification of Industries on the Basis of Ownership and Management

The ownership pattern and management of industries in a country is based on her economic system, production relations and the industrial

policy. Thus, the classification of industries on the basis of ownership can be attempted only on the basis of the system of the economy in a country. Most of the countries in the world can be classified into three types of economies.

Capitalist Economies

In such economies, means of production are owned individually. If some people join together in producing some materials, the share of their ownership is decided clearly. In such a system the means of production are controlled by a few and majority of the people hire out their labour. This is the main reason for the conflict between the capital and the labour. The industries in such economies are classified in these sub-types.

Some capitalists establish the industries individually by investing their own capital. They manage them by themselves and are responsible for their expansion, profits and losses.

Some capitalists join together under partnership to establish industries. The share of each partner in the capital investment as well as profit is pre-decided. Thus, the partnership increases the capital-investment capacity through cooperation.

Sometimes industries are in the hands of corporations. They are bodies formed by individuals or organisations which strive to fulfil pre-decided objectives and goals. The corporations collect capital by selling shares. The share holders have limited rights and liabilities.

Many industries in the modern world are owned and managed by multinational corporations. Bata, Coca Cola and Hindustan Lever Ltd. are the examples of multinational corporations.

Socialist Economies

In socialist economies the ownership of means of production is with the State. Hence the industries also are owned by the State. People are given employment in the industries according to their skills. The state decides about the location of

industries in different regions. One of the major objectives of locating industries in different regions is to remove the regional imbalance in the industrial development.

Mixed Economies

Public and private sectors co-exist in such economies. Mostly the basic industries are kept in public sector and consumer goods industries remain in private sector. India is one of the examples of mixed economy. Establishment of socialist pattern of society is the declared goal of our constitution.

Industrial Regions or Complexes

The interdependence of industries increases with the development in the scale of industrial production. Industries dependent upon the products of the other tend to locate themselves together. Thus, they take the advantage of the existing infrastructures. For example, when an industry is established, certain infrastructure such as power, water, means of transport etc. are also developed. In order to take the advantage of these facilities, other industries are also attracted towards them. With an increase in industrial activity, some other facilities such as banking, skilled labour, experienced managers, financial advisory services, research and development facilities are also available. Thus a cluster of similar or interdependent industries develops in the region. These clusters are known as *industrial complexes*.

Industrial processing has become quite complex today. Some industries manufacture all components necessary for their products themselves. However, in certain industries only assembling is done by them while their component are produced by other ancillary industries located near by. Examples of such industrial complexes are—Petro-Chemical industrial complex along the coast of the Gulf of Mexico in

USA, Ural industrial complex in Soviet Union and Rhine Valley industrial complex in Europe. Several factors are responsible for the growth of the industrial regions or complexes. Some of them are direct, others are indirect such as historical, political and social. These factors can be understood clearly through descriptions of some of industrial complexes of the world.

Industrial Complexes of North America

The huge industrial region of North America extends between St Lawrence Valley of Canada in the north and southern Appalachians in the south from Missouri and Mississippi valley in the west to the Atlantic coast in the east. The maritime ring of North America is a highly industrialised region.

This industrial region is not homogeneous from the view point of industrial structure and product specialisation rather small clusters with specific product specialisations have developed within this region. A very important industrial complex of North America is located south of Ontario around The Great Lakes and the St. Lawrence valley.

The concentration of Canadian population in the St. Lawrence valley, availability of cheap means of water transportation through the Great Lakes and the St. Lawrence river, hydroelectricity from Quebec, iron ore from Steep Rock, Quebec and Ontario, coal from Appalachian region and soft wood from the coniferous forests of Canada are some of the factors responsible for the development of iron and steel and other industries in this complex. Many industries of machine building, paper and pulp, and food processing have been located along the St. Lawrence river.

Textile industry was the basis of industrial development in New England Region but now this region has become important for manufacturing machinery, metals, woolen textiles, cars, ship building, food processing and plastic and

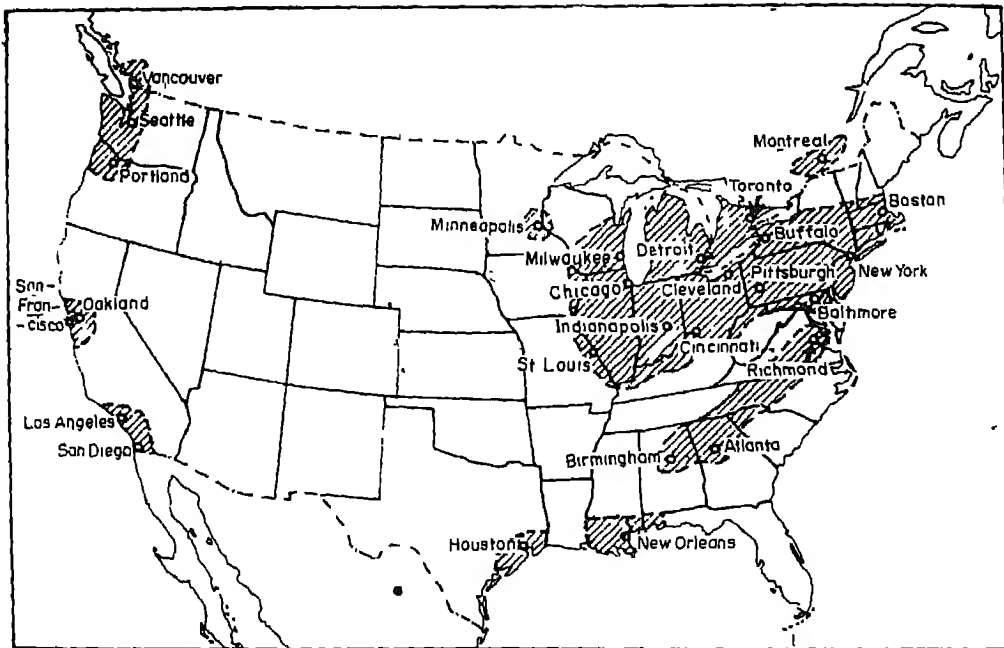


FIG 9.1 North America—Major industrial complexes and centres

leather goods. Boston and other surrounding cities specialise in apparel industry. Providence, New Bedford, Fall-River are other important industrial cities but most of these specialise in machinery industry. There are a number of copper based industries in the Connecticut valley. A number of factors are responsible for the industrial development of New England region. The European immigrants settled first in this region. The density of population increased and consequently the demand for industrial goods also increased. The hilly terrain and presence of fast flowing rivers facilitated the generation of hydro electric power. This area was densely forested hence wood was readily available for ship building.

The Great Lake region is the most important industrial complex of United States of America. This region has diversified industrial activities.

Pittsburg, Wheeling, Youngstown and Cleveland are centres of iron and steel and machinery industries. Detroit is a famous centre for motor car and aeroplane industry. Cars and its spare parts are manufactured at Pontiac and Flint. A number of important industrial towns are located on the southern coast of Lake Michigan. Iron and steel industry dominates the landscape from Gary to Chicago. Chicago has been an important centre for beef industry. The cheaper means of transportation provided by the Great Lakes has played an important role in the development of industries in this region. In the mid-Atlantic coastal region comprising states of New York, New Jersey, Maryland, Eastern Pennsylvania and East Virginia, specialisation has been attained in garment industry. Other important industries are electrical machines, printing machinery, food processing, cigarettes, chemicals and metal indus-

tries. Facilities of good ports and oceanic routes have facilitated the import of raw materials.

In the middle part of New York state there is a narrow belt running from Albany to Buffalo where textiles, utensils, camera and lens industries have developed. Most of the industrial centres in this complex have specialised activities, e.g. garments at Troy, iron and steel and machinery industry at Buffalo and Gloversburg.

Textiles, Tobacco, paper and food processing are important industries in the south Appalachian industrial complex. Birmingham is an important centre of iron and steel, textiles, machinery and chemical fertiliser industries.

In southern United States of America, an industrial complex lies from Carolina to Louisiana and Texas. Dallas, Atlanta and Houston are important industrial centres. Textiles, tobacco and timber industries are important in North Carolina while Texas, Oklahoma and Arkansas specialise in food processing, petro-chemicals and chemical industries.

There is an important industrial complex on the western coast of United States in California. San Francisco and Los Angeles are important industrial centres where food processing, aeroplane making and petro-chemicals are important industries.

Industrial Complexes of Europe

Europe is the birth place of industrial revolution. The industrial complex in the west of Europe extends from the central region of United Kingdom to Poland in the east and from Sweden in the north to Po Valley of Italy in the south.

United Kingdom is a small country but a number of industrial complexes have developed here. London and its environs have many textile, chemical and engineering industries. Oil refineries, soap tanning and ship building industries are located on the bank of the river Thames. Food processing, car, glass, camera and furniture industries have developed in the northern part of

London. In the middle region, Birmingham is a centre of iron and steel and heavy machinery industries. North-eastern region is also known for manufacturing iron and steel, ship building and railway goods industry. The other important iron and steel region is South Wales. In the Scottish Lowlands, Glasgow is a centre of machinery and ship building industry. Coatbridge, Motherwell and Hamilton are chief steel producing towns.

The most important industrial complex of Europe is the Rhine river valley. The industrial complexes of north Rhine valley extend from Switzerland to Federal Republic of Germany. Rhine water-way and availability of hydro-electric power are the main factors for the development of industries in this region. The major industries are leather, textile, timber, car, chemical, glass, paper and pulp, electrical engineering, photographic material etc. Strasbourg, Mannheim and Stuttgart are the main industrial centres in this complex.

Rich coal resources are located in the lower Rhine valley. Besides this important power resource, this region is very well connected with railways, Rhine water-way and a number of canals. This is a thickly populated region of Europe. Therefore, besides providing cheap labour to the industry, it also provides huge market for the manufactured goods.

In France, a complex based on iron and steel industry has developed from Nancy to Saarland, in the Lorraine Saar region. Nancy and Metz are centres of heavy industry. Other important industries are machinery, leather, textile and electrical goods etc.

Another important industrial complex has developed between northern France and Belgium, based on the coalfields of Sambre, Meuse and Compiègne. This complex is important for iron, zinc, arms and glass industries. Liege is the centre of manufacturing guns, pistols and other fire arms. Charleroi is an important centre of glass industry.

Besides these, a few scattered industrial clust-

ers have developed in different parts of Europe e.g. the Industrial complex in northern Belgium and Netherlands. Match, paper and pulp, and timber industries based on the forest resources have developed in southern Sweden from Stockholm to the southern bank of Lake Vanern. The north Silesian industrial complex is located in the upper valley of Odra river, where important industries are chemicals, textiles and engineering.

In Po river valley of Italy, car, aeroplane, railway engine and textile industries have developed in the industrial complex located between Turin and Milan cities.

Industrial Complexes of Soviet Union

European part of Soviet Union was industrially more developed but after the second world war Asiatic part also witnessed rapid industrial development. The traditional industrial complex of Soviet Union is located within the triangle formed by the line joining Leningrad, Odessa and Gorkiy. Its centre is Moscow. There are a few smaller industrial clusters within this large com-

plex.

Around Moscow and Tula surrounded by Shcherbakov in the north, Smolensk in the west, Bryansk in the south and Gorkiy in the east, there is an important industrial complex. Earlier it was the region of textile industry but now machinery, car, aeroplane, chemical and good processing industries are more important. Tula is an iron and steel centre. Ivanovo is a textile centre. Yaroslavl, Rybinsk, Kirov and Gorkiy are important centres of machinery, transport goods and metal industries.

Located between Kharkov in the north, Odessa in the south, Kieve in the west and Donets river basin in the east, is the important iron and steel and heavy industry complex of Ukraine. Based on the iron ore of Krivoi Rog and coal of Donbas, iron and steel has been the major industry of this region. Dnepropetrovsk, Dneprozherzhinsk and Zaporozhy are the important iron and steel centres. This region suffered great destruction during the second world war and this experience was responsible for adopting a policy of eastward shift of Soviet industry. However this region still

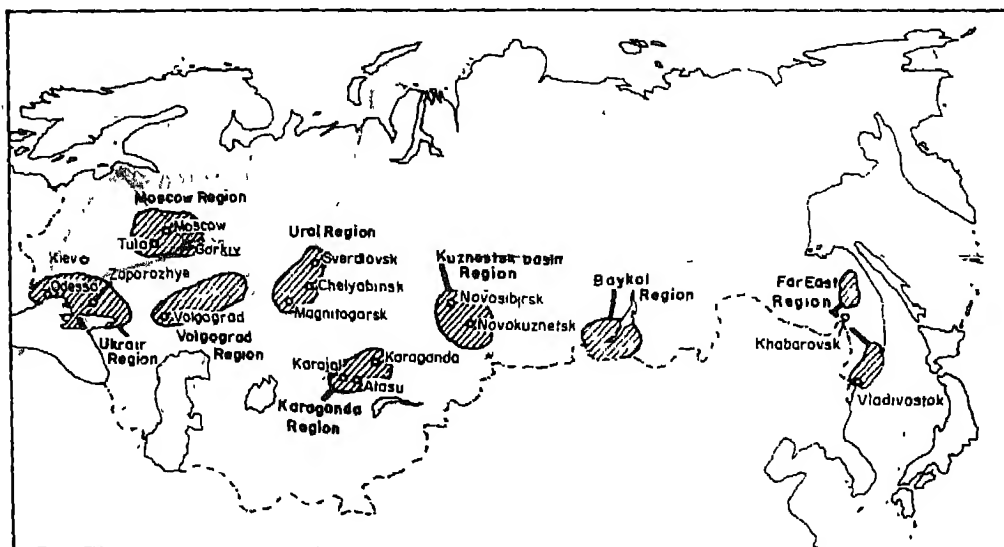


FIG 9.2 Soviet Union—Major industrial complexes and centres

remains a very important industrial complex of Soviet Union.

Ural region has very rich iron ore deposits. It is linked with Kuzbas coal region by Trans-Siberian railway. The industrial axle of Ural complex is Sverdlovsk. Tractor and agricultural machinery, aeroplane, chemical and machinery industries are important in this complex. Nizhny Tagil, Chelyabinsk and Magnitogorsk are important iron and steel centres.

Central Volga region has traditionally been an agriculturally important region but after the discovery of mineral oil, it developed into a major industrial complex. Kazan in the north, Kuybyshev and Saratov in the centre, and Volgograd in the south are major industrial centres. Volga river has been dammed at Kuybyshev to create a large reservoir to generate hydroelectric power. The main industries of Volga industrial complex are agricultural implements and machinery, food processing, timber, matches, and boats for river transport. This complex has very efficient transport network. Moscow - Volga and Volga - Don canals are navigable and provide cheap inland water transport.

Kuznetsk basin in western Siberia has rich coal deposits, which is transported to the Ural region. The returning wagons after emptying the coal, bring iron ore from the Ural region. This is known as *Ural-Kuznetsk combine*. Iron and steel industry has been developed here based on the local coal and iron ore from the Ural. Novokuznetsk is the major iron and steel centre. Novosibirsk is the centre of machinery industry. Chemical, agricultural machinery and timber industries are other important industries in this complex.

A small industrial complex has developed south of Lake Baikal which has been greatly facilitated by Trans-Siberian railway. Irkutsk, Chermkhovo, Ulan Ude are the centres of agricultural machinery, mining machinery and wood-based industries. Chita is an important centre of making fur goods.

An industrial belt has developed along the line joining Dushanbe, Frunz and Alma Ata in Soviet Central Asia. This region is an important cotton producing region due to the development of irrigation facilities. Based on the cotton as raw material, cotton textile industry has developed at Kustnai, Alma Ata, Tashkent, Samarkand and Dushanbe.

Vladivostok located in the far eastern part of Soviet Union is the terminal station of Trans-Siberian railway as well as a very important port of the Pacific coast. An industrial complex has developed from Vladivostok to Komsomolsk-on-Amur. Vladivostok is a centre of ship building industry. Match, leather and leather goods, fish processing are also important industries located at Vladivostok. Khabrovsk is a centre of agricultural machinery and food processing industries. Flour-milling, cement and wood-based industries have been established at Komsomolsk.

Industrial Complexes of Japan

Japan is one of the important industrial countries of the world. Industrial complexes have developed in the coastal plains.

In the Kanto plains on the eastern coast of Honshu island an important industrial complex based on iron and steel, ship building, machinery, chemical, aeroplane and textile industry have developed. The industrial growth has been very fast.

Kobe, Osaka and Kyoto are important industrial centres of the Kinki plain industrial complex. Traditionally Osaka was a weaving centre and Kyoto was famous for its handicrafts and toy industry but now many large scale industries have developed. Small steel plants, machinery, silk, chemicals, camera, and electronic industries dominate the industrial landscape.

Nagoya industrial complex has been famous for silk, woolen and cotton textiles. After 1960, the car industry has developed fast and today it

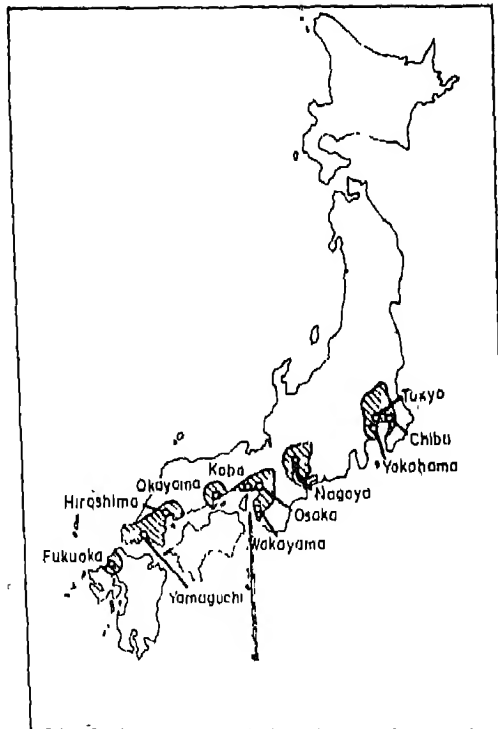


FIG. 93 Japan—Major industrial complexes and centres

is known as 'Detroit of Japan'.

Heavy industries based on ferrous metallurgy have been developed in Kii-Kyushu industrial complex. Coal is locally available and iron-ore is imported from outside. Shimonoseki, Nagasaki, Moji and Wakamatsu have developed as iron and steel centres.

Japan being an island country has developed efficient port facilities which have in turn, facilitated the development of industrial complexes along the coast. The hilly terrain with fast flowing rivers provided favourable conditions for development of hydro-electric power. Japanese labour has been extremely disciplined and has

worked with a sense of commitment. The electronic industry, opticals, camera and car industries are the major industries which have recently been developed and most of these products have assumed international importance.

Industrial Complexes of China

China has been an agricultural country hence the history of the development of modern industry is not very old.

Southern Manchuria has been an iron and steel producing region. Shenyang is an important iron and steel centre. Car and chemical industries are

located at Changchun, Shansiui, Hobei and Shandong industrial complexes have developed iron and steel, heavy industry and textile industry.

A number of small industrial complexes have developed in the Chang basin. Shanghai is a centre of food processing, ship building, cement and engineering industries. Wuhan is the main industrial centre in the middle Chang valley. Chungking in the upper Chang valley, is a centre of cotton and silk textiles, fertilisers and plastic industry.

Industrial Complexes of India

Four industrial clusters have developed in India.

The eastern industrial cluster extends over southern Bihar, West Bengal and Orissa. This region is rich in coal, iron ore and other minerals. Hence iron and steel industry has developed in Kulu-Burnpur, Jamshedpur, Durgapur, Bokaro and Rourkela. Jute mills dominate the industrial landscape on the banks of Hoogly. The main factors responsible for the development of this industrial complex, besides the availability of minerals, are the power resources from Damodar valley corporation, cheap labour from thickly populated states and efficient means of transport.

The other major industrial complex in India has developed in the Bombay hinterland extending between Bombay and Vadodara through Surat and Bharauch. This complex is famous for cotton textile and chemical industries but now it has become important for petro-chemical and pharmaceuticals also.

In the southern states of Andhra Pradesh, Tamil Nadu, Karnataka and Kerala, a few small industrial clusters have developed. The belt comprising of Coimbatore - Madurai - Madras is dotted with cotton textile, electrical goods, chemical and leather industries. There are some industrial cent-

res with specialised products e.g. machine and tool industry at Bangalore, ship building and fertiliser industry at Vishakhapatnam and oil refinery at Cochin.

In a continuous belt of Delhi, Haryana, Punjab and western Uttar Pradesh a number of industries have developed e.g. textiles, machinery, car, electronics, cycle, agricultural machinery and pharmaceutical industries.

Some industrial clusters in India have been established to remove the regional imbalances. Industries at Bhilai, Ujjain, Bhopal and Jagdishpur are some such examples.

Industrial Complexes in the Southern Hemisphere

Amongst the three southern continents, Australia has developed industrial cluster in the eastern coastal region. Important centres are Sydney, New Castle, Brisbane and Melbourne. Perth is an industrial city on the western coast of Australia.

Small industrial clusters have also developed in South America near Rio-de-Janeiro, Sao Paulo, Volta Redonda and Belo Horizonte. Industrial activity is scattered in Chile, Argentina and Venezuela.

Africa is industrially not very developed. Lack of means of transport, low density of population, extreme climatic conditions and lack of capital in the countries exploited due to colonialism are some of the reasons for the slow progress of industries in Africa. Most of the industrial complexes are located in South Africa, particularly between the cities of Johannesburg and Pretoria.

Capetown, Durban, Port Elizabeth and East London are some of the port towns which have attracted industrial activities.

EXERCISES

Review Questions:

1. Answers following questions briefly :
 - (i) What do you understand by manufacturing?
 - (ii) Why is the industrial revolution an important event in the history of the development of industries?
 - (iii) How did the colonialism start?
 - (iv) What is an industrial complex?
 - (v) Which is the most important industrial complex of Europe and why?
 - (vi) Why has the industrialisation in North America taken place in the maritime ring?
2. Distinguish between :
 - (i) Small and large scale industries
 - (ii) Industries in private and public sectors
 - (iii) Basic and consumer goods industries
 - (iv) Cottage and small scale industries.
3. Name the major industrial complexes of United States of America. Describe the New England and Great Lakes industrial complexes and discuss the reasons of their development.
4. Give a comparative description of Ukraine and Ural industrial complexes.
5. Name the industrial complexes of Japan and discuss the industrial structure of Tokyo-Yokohama complex.
6. Which are the important industrial complexes in Africa? what are the main reasons for slow pace of industrial development in African countries?
7. Make appropriate pairs of the industries and cities

<i>Industry</i>	<i>City</i>
Petro chemicals	Detroit
Iron and steel	Vishakhapatnam
Cotton textiles	Pittsburg
Ship building	Liverpool
Silk industry	Chicago
Automobile industry	Vadodara
Meat processing	Osaka
Woolen textiles	Rochester
Camera and optical industry	Bradford
	Cochin

Cartographic Work

8. Show the following on the world map
 - (i) New England industrial complex
 - (ii) Kuzbas industrial complex
 - (iii) Kita-Kyushu industrial belt
 - (iv) Cities of Boston, Cleveland, Birmingham, Turin, Gorky, Novosibirsk, and Ulan Ude.

CHAPTER 10

Location of Industries and Major Industries of the World

THE location of industry at a particular place is the result of a number of decisions taken at various levels. There are certain geographical factors which facilitate this decision making. There are other factors which fall outside the subject matter of geography. The other important fact to be remembered is that the validity of a factor changes with time and space. A particular factor of location may be important at a particular place and time but some other factor may be more relevant at some other point of time or place.

Locational Factors

Traditionally the main geographical factors responsible for the location of industries comprise of raw materials, energy, sources, labour, market and means of transportation.

Raw materials are the basic requirements for manufacturing industry. Some raw materials lose weight during processing but others do not. For example, 10 quintals of sugarcane is needed to manufacture 1 quintal of sugar, hence the sugar mills are located in those areas where sugarcane is grown. Many industries do not require much of raw materials and these can be located anywhere independent of raw material sources e.g. garment and electronic industries. There are some industries which are not wedded to any particular raw material. Such industries are known as

~~foot-loose industries.~~ With the expansion and development of means of transportation the role of raw materials in the location of industries has almost lost its significance. The establishment of iron and steel industry in Japan and cotton textile industry in Liverpool prove the fact that the multinationals and countries with sufficient capital can manipulate the means of transportation in their favour and obtain raw materials.

In the earlier phase of the industrial revolution, the industries were generally located near the source of energy as they have fixed locations. Now, large scale generation of hydro electric power, ability to transmit it at high voltage to far off places and proper distribution over larger areas through grid system have made it possible to take the energy to any location. The dependence of industries for their location on energy resources have considerably been reduced. However, some energy intensive industries such as aluminium industry, are still located near the energy sources.

Two aspects of labour are important for the location of industry. Firstly, the availability of cheap labour in large numbers and secondly, the level of their skills. For labour intensive industries, cheap labour should be available. Skilled labour is costly but their efficiency and skills compensate for the higher wages. Some industries are located at a particular place due to the availability of skilled labour. For example elec-

tronic industry in Japan, utensil industry in Jagadhari and Moradabad and glass industry in Ferozabad in India have developed due to the availability of skilled labour. Labour is more mobile than other factors of production. It can be moved from villages to towns, from towns to metropolis, from one industry or place to another or even from one country to the other country. This mobility is mainly ascribed to differential wage rates in different situations.

Any entrepreneur does not produce any item for which there is no demand. Market represents a place or region where the buyers and sellers meet. The size of market is closely related to the purchasing power of people. Many industries are located near large urban centres because the concentration of population in those areas ensures readily available market. The role of market in the location of industry may be understood with the example of edible oil industry. If the technology used for extraction of the oil is primitive such as in *Kolhu* or *ghani*, the industry is located in the village and locally available raw material (oil seed) is used. Oil extracting industry based on a more sophisticated technology moves towards the towns. This type of industry uses more than one type of oilseed as raw material. More complicated and highly sophisticated technology is used for large-scale production. Such large scale oil industries are located near metropolitan centres where the size of market is large.

Transportation plays a special role in bringing raw material to the industry and finished products to the market. The means of transportation help in the development of industry. At the same time, after the location of industries at a place, the means of transportation also develop very fast. The concentration of large industries in the Great Lakes region has been caused by cheap means of water transportation provided by the lakes. Almost all large industrial towns in Japan are ports. The cheap water transport has facilitated the development and concentration of jute mills in

the Hoogly valley in India and large industrial towns in the Rhine valley of Europe. The lower transportation cost helps reducing the cost of production. Thus, the means of transportation are important factors for location of industries.

Some factors are crucial for the location of certain industries. For example, the cotton mills were established earlier in the hinterland of Bombay because coastal location provided high humidity in the air. It prevented the yarn from breaking. Now it is possible to maintain the required amount of humidity in the mills with technological intervention. It is therefore, possible to establish spinning mills away from the coast. Water is an important factor in industrial location. It is required in large quantities in cotton textile industry for bleaching and in iron and steel industry for cooling. It is possible, now, to carry water from one place to the other through pipelines. In certain situations the demand of water is so large that it cannot be met through transportation of water and such establishments are taken to the sources of water such as nuclear reactors.

The location of some industries is decided by institutional factors e.g. historical, social and political decisions. Location of industries in backward regions in order to reduce economic disparity and shifting of industries to the interior parts of a country due to strategic reasons during war are examples of institutional decisions in the location of industries.

The location of modern industries is not guided by a single factor due to its complex nature. All aspects have to be considered and analysed before deciding location of industries.

Iron and Steel Industry

Iron and steel industry provides the base for all other industries hence it is also known as *basic industry*. It is not only the backbone of an economy but also a measure of its strength.

Iron and steel are obtained by mixing the iron ore with coke or sometimes charcoal and lime-

stone and smelting them together in a blast furnace. The high temperature required to melt the iron ore is managed by blasting hot air, oxygen and oil. This is why the furnaces are called *blast furnaces*. The molten iron, after purification, is either released in mould to make pig iron after cooling or transferred to the steel furnaces directly for making steel.

The pig iron is remelted and transferred in moulds of different shapes and sizes. After solidification, it is known as cast iron. It is hard and strong but very brittle and breaks easily, because it contains many impurities e.g. carbon, silicon, sulphur and phosphorus.

Pig iron is melted for purification. The high temperature removes its brittleness. Now it can be rolled or hammered to any shape. It is known as wrought iron. It is hard and rust-proof. After purifying the pig iron carbon in a certain proportion is mixed for making steel. Steel can be converted to any shape e.g. rail-sheets, tubes, wire or plate.

Iron and steel industry is important in United States of America, Soviet Union, European countries, Australia and India. Japan, South Africa, Brazil and Colombia are other iron and steel producing countries.

The Great Lakes region in United States of America is the leading iron and steel producing region. The good quality coke is available from Pennsylvania. Iron ore is brought from the mines of Lake Superior region i.e. Mesabi, Cuyuna, Gogebic and Menominee etc. Limestone is obtained from the neighbourhood of Alpena located on the western coast of Lake Huron. Limestone is also available from Appalachian mountains. Water is available in plenty from the local rivers and lakes for cooling. This part of United States is densely populated which ensures large supply of labour. The high density of population and development of iron and steel based industries have created large market in this region. Pittsburg and Youngstown to the east of the Great Lakes and Chicago and Gary to its west

are the major centres of iron and steel industries. There is a great demand for iron and steel in the industrial complexes of Detroit, Toledo and Cleveland as well as the rail industry of Chicago. The demand for iron ore is high in the industries located on the coasts of Lake Erie. It is met from the mines of Lake Superior region and the Labrador mines. They are brought by ships through St. Lawrence seaway.

Iron and steel industry has also developed in the Atlantic coastal region. Iron ore is imported from Venezuela, Labrador and Chile as the coast location has facilitated the oceanic transport. Alabama is the third important iron and steel producing region. Birmingham is the most important iron and steel centre of this region.

The second world war created a situation before west European nations that they had to turn towards cooperation rather than competing with each other. Six countries joined together to form a cooperative community in 1952, France, Federal Republic of Germany, Netherlands, Belgium, Luxembourg and Italy became its members. In 1973, United Kingdom, Ireland and Denmark also joined it. It is known as European Coal and Steel Community. The major objective of the community is to provide facilities for the supply of iron ore and coal to the members of the community without any hindrance. Earlier, iron and steel industry in Europe was closely linked with coal mines but now some industries have moved to the port towns and some have been established near the iron ore mines.

The iron and steel industry in Europe has developed in France-Belgium, Lorraine, Luxembourg-Saar, Ruhr and north, north eastern and central parts of United Kingdom. Lorraine has the largest iron-ore reserve in Europe. Ruhr region has high quality coking coal. Rhine river and the canal network developed in the region provide cheap water transport. Demand for iron and steel in the local industries is huge. Most of the west European countries have high level of industrialisation.

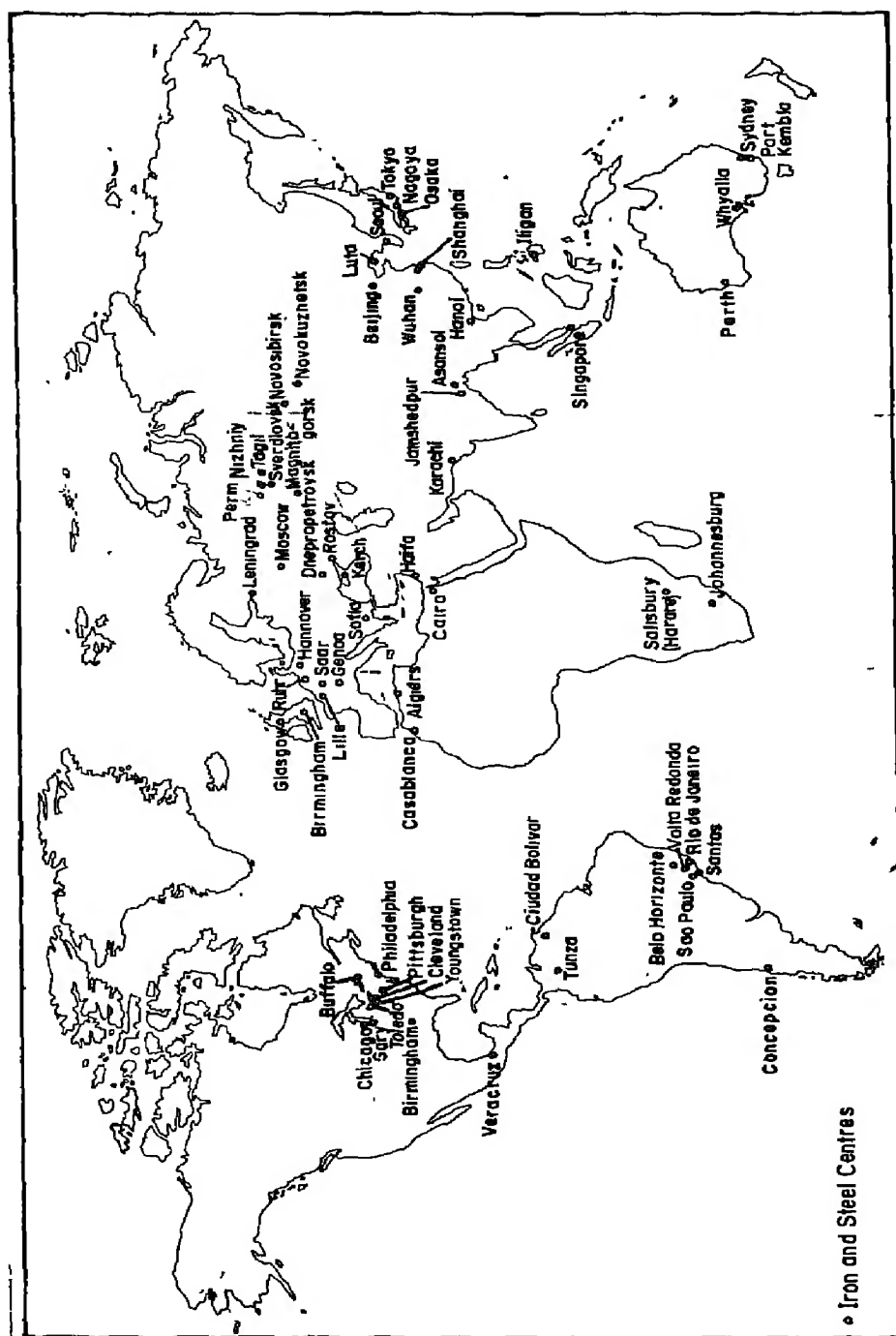


FIG. 101 World—iron and steel industry

In United Kingdom, some iron and steel industries are located near the coal mines such as Birmingham, some are located near the iron ore mines such as Fordingham and some are located near the ports like Talbot. Other iron and steel producing countries of Europe are Sweden, Poland and Czechoslovakia.

In Soviet Union, iron and steel industry has developed in southern Ukraine which is based on the iron ore from Krivoy Rog and Kerch peninsula, coal from Donetsk basin (Donbas) and local manganese. The Ural region is another important steel producing region of Soviet Union. Iron ore in this region is obtained from Magnet mountains, coal from Kuznetsk basin (Kuzbas) and Karaganda basin. Trans-Siberian railway provides surface transport. Sverdlovsk; Magnitogorsk and Nizhny Tagil are major iron and steel centres. Besides these major regions, iron and steel industry has also been located in Kuzbas and Caucasus region.

Kuznetsk basin has large coal reserves. Coal is transported through Trans-Siberian railway from here to the Ural region. The empty wagon returning from Ural region brings iron ore to Kuznetsk basin and local coal has been utilised for developing iron and steel industry in this region. This is known as Ural-Kuznetsk combine. Now some local iron ore reserves have also been found. Main iron and steel centres of Kuzbas region are Novokuznetsk and Novosibirsk. Iron and steel industry has also been located in the Amur valley and on the Pacific coast in the far east.

In Asia, iron and steel industry has developed in Japan, China and India.

The iron and steel industry in Japan developed in response to the large demand in engineering and ship-building industry. This demand accounts for the rapid development of iron and steel industry in Japan in spite of the fact that she neither had large iron ore deposits nor coal reserves. Kyushu island of Japan has very limited coal reserves. Japan imports large quantities of coke,

iron ore, pig iron as well as scrap iron. The iron and steel industry has been located in southern Honshu and northern Kyushu islands.

The history of the development of iron and steel industry in China started in the post revolution period i.e. after 1949, though Japanese had established it at Anshan and Fushan in Manchuria earlier. Iron ore is found only at a distance of 125 km from Anshan, coke at a distance of about 136 kms and limestone at a distance of 22 kms. Besides Manchuria, Shanxi, Shenyi, Hobei and Shandong are the major iron and steel producing provinces.

Three iron and steel plants were established in India before independence. Two of these were located at Jamshedpur and Kulti-Burnpur based on the iron ore, coal and manganese resources of Bihar, West Bengal and Orissa. Mysore Steel Works at Bhadravati was established by exploiting the iron ore resources of Karnataka. In India, iron ore reserves are located in Keonjhar, Mayurbhanj, Guru Mahisan, Badam Pahar, Bonai and Noamundi. Coal is available from Jharia, Raniganj, Karanpura, Giridih, Talchir, Singrauli and Korba. Manganese is obtained from Bonai and limestone from Birmitrapur. The high density of population in eastern India provides cheap labour. There is a dense network of rail and roads. Water is available from rivers. The industrial hinterland of Calcutta has large demand for iron and steel. This is why three iron and steel plants i.e. Durgapur, Rourkela and Bokaro, have been established in this region after independence. Bhilai was located in backward tribal region in order to reduce the regional imbalance in economic development.

Australian iron and steel industry is based on the coal found in the Hunter valley of New Castle. It is located on the eastern coast. There is an iron and steel plant at Port Kembla in the south of Sydney.

The iron and steel industry in South America is located in Colombia, Venezuela and Brazil. In Colombia, coal is available from Tunja dis-

tract located north of Bogota, iron ore and limestone are available locally and hydro-electric power is obtained from Toba lake. Based on these raw materials iron and steel industry has developed there. In Venezuela, the iron and steel industry is based on the iron ore from El Pao, Serra Bolivar and Dagiana hills, coal and limestone from Nankol and hydro-electric power from Caroni river. The iron and steel industry in Brazil developed after the second world war. The main steel plants in Brazil are located at Volta Redonda, Montevarde and Santos. Chile is also an important steel producing country of South America.

Iron and steel industry has developed in Algeria, Egypt, Zimbabwe and South Africa. South Africa is the major steel producing country in Africa. The industry at Vereeniging utilises scrap iron and pig iron from Natal.

Chemical Industry with Special Reference to Petro-chemicals

Chemicals have multifarious uses. Chemicals are used in one way or the other in agriculture, metallurgy, leather, textiles, paper, glass, sugar, crockery, soaps, fertilisers, medicines and food processing. Chemical industry is responsible for developing new products every day. The recent additions are plastics and artificial fibres. Thus, the chemical industry has bright future. Chemical industry is based on two types of raw materials: *natural* e.g. minerals, coal, petroleum, salts, potash, sulphur, lime-stone, gypsum and vegetable products e.g. pulp, vegetable oils etc; and the *by-products* of other industries such as paper and pulp industry, iron and steel industry and gas manufacturing industry.

There is a long list of the products pertaining to chemical industry because some products are manufactured only for specific use, e.g. paints, pigments, solubles, refrigerants, rubber, chemicals, adhesives, plastics, artificial fibres, fertilisers, insecticides, pesticides, weedicides,

fungicides etc. Major factor for the location of chemical industry are availability of raw materials, cheaper means of transport for bulky materials, water supply, sources for energy and demand of chemicals in other industries.

The major industry based on mineral oil is its refining. The oil refining technology was developed in United States of America, Europe and Soviet Union. Earlier the refineries were generally located near the oil wells. The petro-chemical industry developed in Europe and United States of America after the second world war. The development of large tankers and pipelines facilitated the transportation of petroleum in bulk and this provided favourable conditions for locating the refineries and petro-chemical industries near the markets as well as near the ports.

Most of the petro-chemical complexes in North America are located in the coastal regions. About 30 per cent of the oil in United States of America is refined along the Gulf of Mexico coast and another 15 per cent is refined on the Pacific coast. The refineries located on the east coast get crude oil from Venezuela and West Asia. The refined oil is transported from the Gulf coast to the eastern region through pipelines and to the west by tankers. Petro-chemical complexes have developed in Philadelphia and Delaware in the eastern region and at Chicago and Toledo in the Great Lakes region.

Los Angeles has a big petro-chemical complex on the western coast of United States. In Canada, Montreal has a large petro-chemical industry. The crude oil is brought from Portland and Maine through pipelines and by tankers from Venezuela. The other important petro-chemical complex in Canada is located at Sarnia in Ontario province.

After the second world war, a refinery was constructed in the Paraguana peninsula of Venezuela which receives crude oil through pipelines from the wells located near Maracaibo lake.

The petro-chemical complexes in Europe are located near the markets where these products are

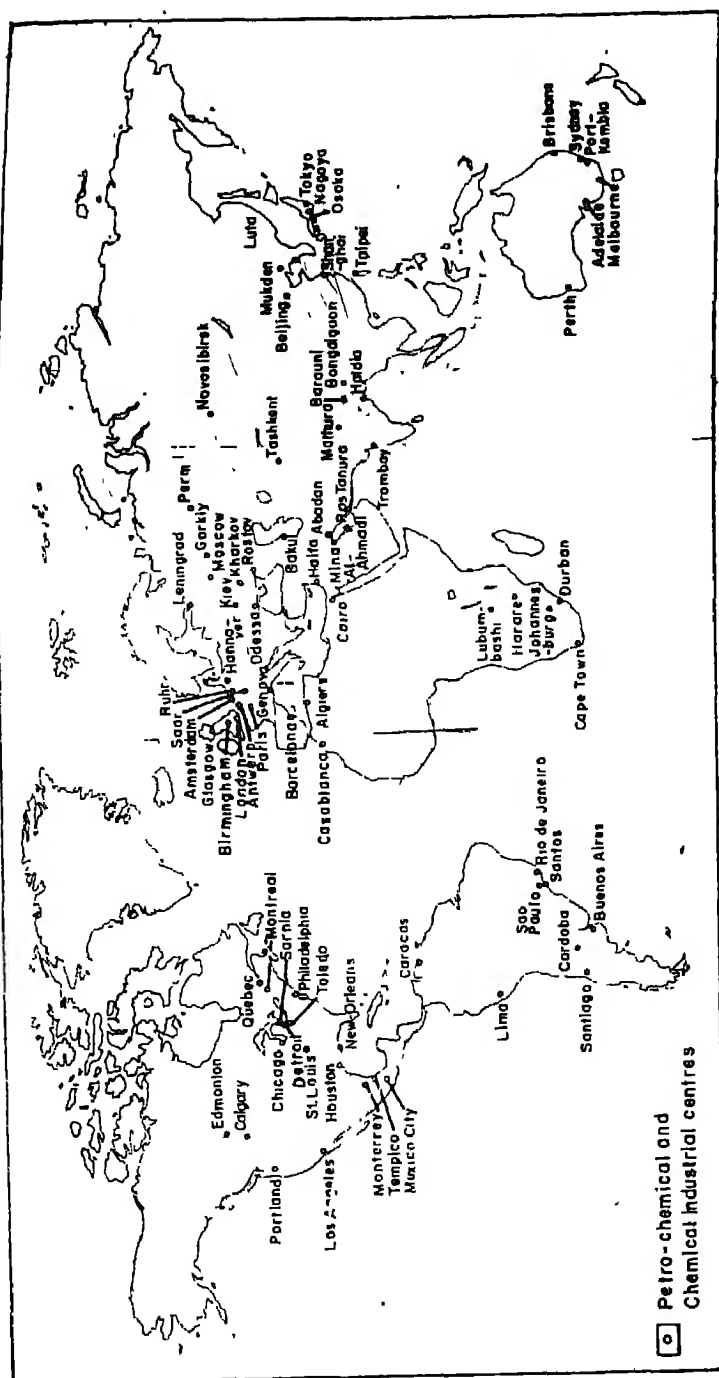


FIG 10.2 World—chemicals and petro-chemical industries

demand. The major complexes are located on the coasts of southern North Sea and English Channel. Main centres are Antwerp, Rotterdam, Southampton and the cities located in the lower Sein valley. The petro-chemical complexes of Federal Republic of Germany are located in Ruhr region. The French refineries and petro-chemical complexes are concentrated between Le Havre-Roven and Marseilles including Paris and Lyons. The first petro-chemical complex in Soviet Union was located at Baku and Grozny because the mineral oil was available from the Caucasian oil fields. New petro-chemical complexes are generally located near the consumption centres. Moscow, Volga, Ural and Soviet Central Asia are the main regions where new petro-chemical complexes have been recently located. The largest refinery in West Asia is located at Abadan. West Asia is a large producer of petroleum but there is little demand because the region is not industrially developed. Thus, most of the petro-chemical complexes are located on the coasts in order to facilitate export. Saudi Arabia has a large petro-chemical complex at Ras Tanura while Mina-el-Ahmadi is the largest petro-chemical complex of Kuwait.

The largest petro-chemical complex in India was established by Union Carbide at Trombay. A petro-chemical complex has been developed along with the refinery at Koeli in Vadodara. Indian Petro Chemical Corporation has been established under public sector. It has started a petro-chemical complex at Jawahar Nagar near Vadodara. Bongaigaon in Assam is another petro-chemical complex under the public sector. Haldia and Barauni have been established for petro-chemical processing.

Three large fertiliser complexes are being developed at Bijaipur, Swami Madhopur and Jagdishpur by utilising the gas brought through HBJ pipe lines. The Mathura refinery has started diversification of products besides refining the oil.

Textile Industry

Cloth is the basic need of human beings. Therefore, cloth making is an ancient art though its large scale production with the help of machines is a recent activity. Textile industry has provided employment to a large number of people not only in industrially developed countries but also in developing countries. History of industrial development in Japan, India, Brazil and Egypt started with the development of textile industry.

The raw material for textile industry is obtained from hair of animals and vegetation. Wool, silk, cotton and flax etc. are raw materials derived from natural sources. Some raw materials for textile industry have been developed by man using his technological and scientific knowledge e.g. nylon, rayon, terylene, teracel etc. Some other fibres have been developed by blending natural and artificial fibres e.g. terycot. The most important fibre developed artificially by man is rayon which is made of pulp. Thus, it is a product of the mixture of vegetation and chemicals. Other products like nylon, terylene, acrylon etc. are developed purely from the synthesis of chemicals and minerals.

Chemical Industry with Reference to Textile Industry

The chemical industry has directly influenced the textile industry in the world. Human beings, by using their scientific knowledge and technological skills, have developed artificial fibres which have challenged the supremacy of the natural fibres as raw material for textile industry. The clothes made from artificial fibres are brighter, more beautiful and durable as compared to the clothes based on natural fibres. This type of cloth does not require ironing as the crease lasts longer. There are two groups of synthetic fibres. Natural polymers i.e. the fibres developed from cellulose and proteins and the fibres developed from purely synthetic polymers. Synthetic polymers are

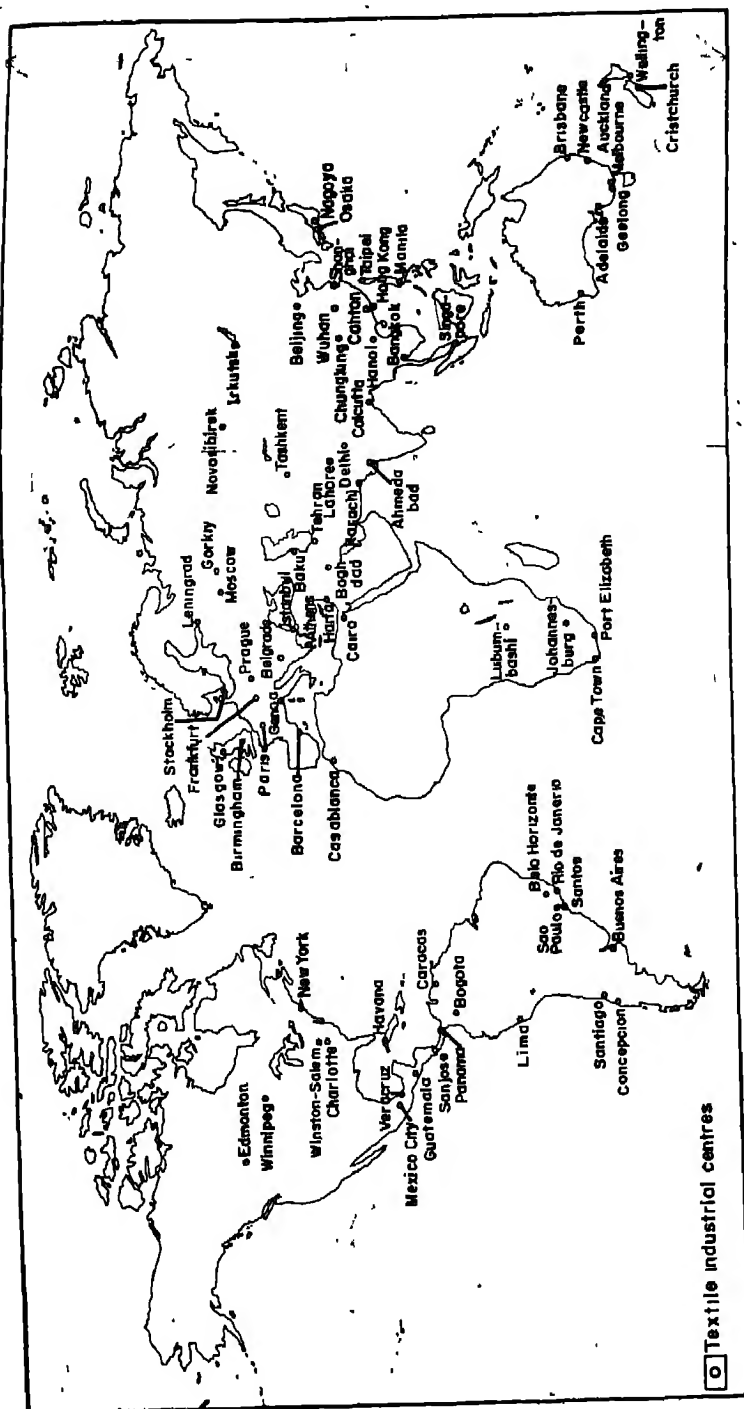


FIG. 10.3 World—textile industry

obtained from coal or petroleum through chemical technology. Rayon is included in the cellulose fibres. It is obtained through viscose or acetate processes. Synthetic or non-cellulose fibres are obtained from coal, petroleum or gas through polymerisation process. Both cellulose and pure synthetic fibres are the gifts of chemical industry because these are prepared through very complex chemical processes. Earlier the main source of cellulose was cotton lint but now it is obtained from wood, bamboo and the pulp of other vegetations.

Large quantities of chemicals like sulphuric acid, caustic soda, carbon-di-sulphide and acetic acid are required for making synthetic fibres. These fibres are prepared as products of chemical industry and are then used as raw materials in the textile industry.

World Distribution of Synthetic Cloth Manufacturing

The technology for manufacturing synthetic fibres has been developed by economically developed countries and therefore, they have monopolised the production of these fibres.

United States of America is an important producer of synthetic fibres. Here this industry is located in eastern Pennsylvania and mid-eastern Atlantic coastal region. Recently it has been developed in Virginia and Tennessee states as they have plenty of water and energy resources, besides the reserves of coal. The major synthetic fibre producing countries in Europe are Federal Republic of Germany, United Kingdom, Italy, France, Netherlands, Switzerland and Spain. These countries import the pulp from Norway, Sweden and Finland.

The synthetic fibre industry is located in close vicinity of the chemical industries. This industry was first developed in France. In 1884, a French chemist H.B. de Chardonnet devised the method for converting a liquid into a solid thread through the nitro-cellulose process. Chardonnet's

factory at Besancon, established in 1890, was the first rayon factory in the world. During late 1930 and early 1940s this industry was developed to reduce the dependence on raw cotton by Germany and Italy.

Japan like United States of America, is an important producer of synthetic fibre. Japan like Germany and Italy felt the shortage of raw cotton during the period of second world war and developed its synthetic fibre industry. This industry is concentrated along with the chemical industry in southern Honshu, Kyushu and Shikoku islands.

The soft wood from the Taiga conical forest belt in Soviet Union is an asset to the synthetic fibre industry. This industry is concentrated in the western and mid-northern parts of Ural industrial region because this region lies at the meeting points of chemical industry and the conical forest belt.

The synthetic fibre industry is quite recent in origin. It has shown a trend of rapid development in the recent past.

Industries and Water Pollution

The wastes from the industries of paper and pulp, textiles, petro-chemicals and sugar are discharged to the rivers and other water bodies and thus pollute the water. Insecticides and pesticides are used to save crops from insects and pests. These poisonous substances and chemicals mix with rain water and flow to the rivers along with the runoff. In large industrial cities, the effluents coming out of the factories have created grave problems of water pollution. The death of large number of fish in the Gomti river near Lucknow and the pollution of the Ganga by the tanneries of Kanpur are examples of river water pollution from the effluents of industries. The large industrial agglomerations located in the coastal regions and the leakage of oil from large tankers in the oceans have threatened the pollution of oceanic water also.

Polluted water is the main cause of many air-

ments of the stomach. The problem of water pollution is more serious in developing countries. Most of the countries have passed laws to check the water pollution. These laws should be implemented more strictly. The factories should not be allowed to discharge the effluents directly in the water courses. They should make arrangements for cleaning and recycling the water. The use and re-use of the recycled water should be made compulsory for the factories. They should meet the additional demand of water from the recycled water. The pollution of water has threatened the aquatic life-forms. Besides, people using the polluted water and the aquatic life forms, will also be seriously affected.

Industries and Air Pollution

Air pollution is an appropriate example of industrial pollution. Though air is polluted by the burning of fuel in the households as well as by the exhausts of the vehicles, it gets intensified by the fuel burnt in the furnaces of the industries. Majority of the industries use coal or oil as fuel. Both these fuels contain 3 to 4 per cent sulphur. When these fuels burn, sulphur-di-oxides is pro-

duced and gets mixed in the air. Due to reaction in the air its one part is converted into sulphur-trioxide and then into sulphuric acid. This pollutes the air. The fuel, which is not fully burnt, produces carbon-monoxides and the air is also polluted by it. Likewise the sulphuric and nitrogen oxides are emitted out of the factories and become sulphuric and nitric acid when get mixed with water. These reach the ground in the form of acid rains.

The polluted air damages the health of human beings. These gases and polluted particles mix in the blood and weaken the limbs of the body. If people inhale polluted air for a long time they develop chronic bronchitis. It is a common ailment in industrial towns. The polycyclic aromatic hydrocarbons generated by the burning coal in industrial furnaces cause cancer.

The air pollution can be checked by controlling the structure and the heights of the smoke-chimneys of industries. The chimneys should have such nets which can intercept the harmful gases and particles and do not allow these to mix with the air. In Japan, trees have been planted on large scale in industrial areas to check air pollution.

EXERCISES

Review Questions:

1. Answer the following questions briefly:

- (i) Evaluate the factors of location of industries giving suitable examples.
- (ii) Taking examples from the modern industries show the effect of the raw materials on the location of these industries.
- (iii) Write a geographical essay on the iron and steel industry of the Great Lakes region of United States of America.
- (iv) Discuss the factors responsible for the development of iron and steel industry in the countries of the European Coal and Steel Community.
- (v) What do you understand by Ural-Kuznetsk Combine?
- (vi) Discuss iron and steel industry in Japan.
- (vii) Write short notes on the Tata Iron and Steel Company, Jamshedpur and Hindustan Steel limited, Bokaro covering the following:
 - (a) Sources of raw materials
 - (b) Sources of energy
 - (c) Water and labour supply
 - (d) Market.
- (viii) "Most of the petro-chemical complexes in Europe are located near the coasts"? Explain
- (ix) Discuss the advantages and disadvantages of synthetic clothes.
- (x) Why does the air pollution occur from industries?
- (xi) How can the river water be saved from the industrial effluents being discharged into it?

2. A list of raw materials and iron and steel centres have been given below. Match the raw material sources with appropriate steel centre.

<i>Source of raw material</i>	<i>Steel centre</i>
(i) Iron ore from Mesabi	Magnitogorsk
(ii) Scrap iron from Natal	Jamshedpur
(iii) Manganese from Bonai	Pittsburg
(iv) Coal from Kuznetsk basin	Vereeniging

Cartographic Work

3. On a world map show the following:

- (i) Important iron and steel centres of United States of America.
- (ii) Iron and steel centres of Ural, Kuznetsk basin and Ukraine in Soviet Union
- (iii) Petro-chemical complexes of Ras Tanura, Abadan, and Koeli.

CHAPTER 11

Transport and Communication

THE means of transport are used for carrying materials and passengers from one place to the other. The means of communication diffuse the message and ideas. In past, the means of transport and communication used to be the same but with the developments in science and technology specialised means have been developed and their function is now different. Men, animals, different types of vehicles have been used as means of transport in different regions at different times. The invention of aeroplanes, trains, trucks, ships and tankers has revolutionised the transportation system. Likewise great strides have been made in the field of communication starting from runner messengers to postmen, telephones and satellites. The means of transport and communications have reduced the distances in the world. This has also strengthened the inter-relations and inter-dependencies between different regions and countries of the world.

Transportation is performed through different mediums. Geographically land, water and air transport differ from each other. Likewise transportation of cargo is different from transporting passengers. Any medium of transportation has some important elements, for example, the way or route through which transportation takes place, the vehicle on which the goods or the passengers are transported, the power or energy used in the vehicle, and the points of origin and destination. The means of transport have been chang-

ing over time. These are greatly influenced by the relief features and require high capital investment. Today a number of means of transport are being used in different parts of the world e.g. men and animals as carriers and draught power, road and-rail transport, ropeways and cableways, pipelines, internal and oceanic water ways and air transport.

Land Transport

The pathways and unmetalled roads have been used for transportation since ancient times. The economic development and technological revolution were responsible for increasing the demand of transport. To meet this need, transport technology was developed. Metalled roads, highways and railways were developed to accommodate large vehicular traffic. Ropeways, cableways and pipelines were devised to cater to the demands of transporting specific goods. The main means of transport on land are coolie, pack animals, animal drawn carts, motor vehicles and railways. Oil is transported on land through pipelines in bulk. Ropeways and cableways have been developed in rough and undulating terrain. But the highways and railways are used for transporting large bulk of material and large number of passengers.

Highways

Road is a major medium of land transport in

the modern times. It is the quickest medium of transportation for shorter distances. The roads link the fields and farms to factories, factories to markets, and the goods can be delivered right at the door steps of the consumers. There is unequal growth of road transport in the world. In countries of developed economies like North America and Europe number of vehicles is large and road network is dense. Thus road transport is highly developed. Every city and port town in Europe is linked by highways. Cities located on the eastern and western coasts of North America have been linked by highways. A number of highways have been built in north-south direction to link Canada with Mexico. Trans-Canadian Highway links St. John city in Newfoundland and Vancouver in British Columbia. Likewise Alaskan Highway links Edmonton in Canada and Anchorage in Alaska.

The highways are the most important mediums of transportation in African continent due to variation in its topography. A highway joins Algiers across Atlas mountains and Sahara desert, with Conakry of Guinea. A major part of the proposed Cairo to Cape Town highway has already been completed.

Since ancient times, Caravans have been passing through central parts of Asia. Ibn Batuta, Marcopolo and Huen Sang encouraged travelling through land routes. There were no highways at that time rather caravan routes were used to undertake journeys and voyages. Geographically, China is a land of large area. The northern cities have been linked with the southern cities and on eastern coast with the interior parts through highways. Tsungtso city located near the Vietnamese boundary in the south is linked with Beijing. Similarly Shanghai has been linked with

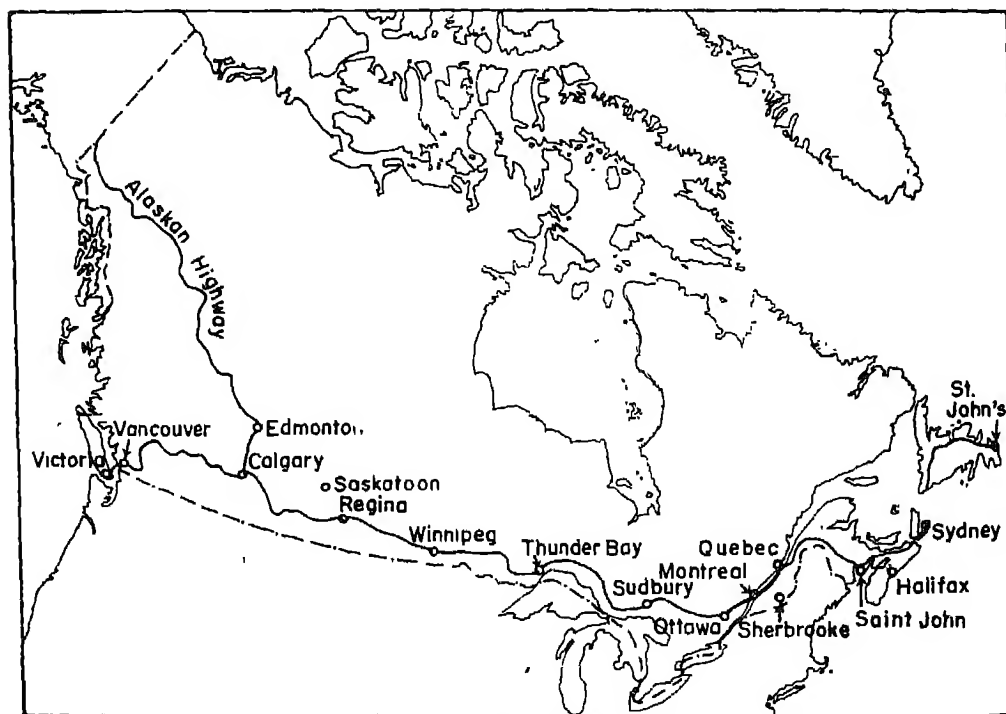


FIG 11.1 Trans-Canadian highway

Guangzhou in the south and Beijing in the north through highways. A highway has been constructed recently to join Lhasa and Chengdu.

A historically important highway in India is Sher Shah Suri Marg which was earlier known as Grand Trunk road (G.T. road). Earlier, it used to link Calcutta with Peshawar but now it is known as National Highway No. 1 between Delhi and Amritsar and National Highway No. 2 between Delhi and Calcutta. Its total length is 1856 kms. National Highway No. 3 links Agra with Bombay and covers a distance of 1,222 km. The longest National Highway is N.H. 7 which links Varanasi with Kanya Kumari via Rewa, Jabalpur, Nagpur, Hyderabad, Kurnool, Bangalore and Madurai. It traverses a distance of 2,325 kms. Besides the National Highways, there are state highways as well which are maintained by the states.

Road network is dense in the European part of Soviet Union, whereas in the Asiatic part it is sparse. Moscow is a focal point where most of the roads converge. Irkutsk is an important node in Asiatic Soviet Union through which the eastern part is connected.

In South America, attempts have been made to connect the ports with their hinterlands. A number of highways have been constructed in Brazil, Bolivia and Peru for accelerating their economic development. It is proposed to construct a Pan-American highway connecting the countries of South America, Central America, Mexico and United States of America. A small portion of this highway between Panama and Bolivia is not yet ready.

One of the Australia's major road links is Trans-Continental Stuart Highway which connects Birdum, the rail head in the Northern Territory to Oodnadatta in South Australia via Alice Spring and Tennant Creek.

Railways

Railways are a quick means of transport on land.

Railways can handle more load in comparison to roads. It is a convenient means for long distance travel. Construction of railways and their maintenance require heavy capital investment. Railways are a product of industrial revolution. Their development took place along with the development of industries. The railways witnessed fantastic growth during mid-nineteenth century. Railways facilitated the carriage of bulky material in large quantities. Movement of passengers, different products and mail became easier. Railways also accelerated the pace of industrialisation. Topography and surface relief, density of population and the level of the development of natural resources are some of the important factors influencing the development of railways.

It is easier and cheaper to develop railways in plains than in mountainous and hilly areas. The railway network is very dense in those countries where the industrial development has induced large scale urbanisation and consequently trade and commerce have also developed. For exploitation of resources it becomes essential to reach the regions rich in such resources.

The railway network in Africa, Australia and South America was developed primarily to utilise their natural resources. In the erstwhile colonies, ports were linked with the hinterlands by rails to siphon out the raw materials. The first rail route in India was developed between Bombay and Thane. Calcutta, Bombay and Madras have been linked with Delhi by fast trains. In Africa railways were constructed by the French to connect Addis Ababa with Djibouti and by the Italians to link Agordat with Massawa. There is a dense railway network in the pampas of Argentina and in the regions of coffee *fazendas* in Brazil. The densest rail network in the world is found in Europe and eastern United States of America. The focal point of railway network in United Kingdom is London in the South and Glasgow in the north. Paris, Hamburg, Berlin and Milan are also focal points of dense

rail network in western Europe. The high level of economic development coupled with high urbanisation are the main reasons for the development of dense rail network in the eastern United States of America.

Trans-Continental Railways

Trans-continental railways are those lines which run across the continent and join its two ends. Most of these trans-continental railways have been constructed for sewing economic and political ends. For example, Trans-Siberian Railway was constructed to integrate the European part of Soviet Union with its far eastern part. The main purpose of Canadian-Pacific Railway was to satisfy British Columbia because it had agreed to join the Federation of States on the condition that it will be linked with eastern part by railway. The Australian Trans-Continental Railway was constructed to save the Western Territory from going out of the Federation of States.

Trans-Siberian Railway

Trans-Siberian railway connects the Central Industrial Region of Soviet Union with Ural, Siberia and the far east. It links Leningrad in the west to Vladivostok located on the Pacific coast in the east. It covers a total distance of 9,332 km. Some of the main stations on this line are Moscow, Ryazan, Sызuran, Kuybyshev, Chelyabinsk, Omsk, Novosibirsk, Krasnoyarsk, Irkutsk, Chita and Khabarovsk. It handles cargo even for the branch lines and for those navigable rivers which are connected with the stations on its route. This railway line carries machineries and other industrial products from the central industrial region of Soviet Union to eastern destinations. Ore, machinery and timber are transported from the Ural region to the west. Food grains are transported towards west from Siberia. Coal, oil, timber, industrial and agricultural products are exchanged between Siberia and far east. The

railway track crosses a number of navigable rivers like Volga, Irtysh, Ob, Yenisey and Amur. These junctions where the rail crosses the rivers, are important points of transshipment. The cargo disembarked at these junctions are transported through these navigable rivers towards north and south. Besides the cargo, it handles passengers originating at different stations and links east and west Soviet Union.

Canadian Pacific Railway

This railway line connects Vancouver in the west with Halifax in the east. It was constructed in 1886. The total length of the proposed as well as constructed track at that time was 7,050 km. Although this railway line was constructed to connect British Columbia with other eastern States of Canada to make it join the Federation of States, it assumed economic importance later on. It links the Quebec-Montreal industrial region with soft-wood forest region and wheat region of prairies. Thus, each region became complementary to the other. A loop line from Winnipeg to the Fort Williams, located on the northern shores of the Lake Superior, connects this railway line with one of the important waterways of the world. Now the wheat from the prairies can be brought to the waterways. Thus it has become economic artery of Canada.

The Australian Trans-Continental Railway is another important line which connects Sydney in the east with Perth in the west. Main stations on this route are Broken Hill, Peterborough, Port Pirie, Port Augusta, Kingoonya, Kalgoorile and Coolgardie. The greatest difficulty on this track is that it has different gauges. Losses resulting from the change in gauge is great. At each state border goods and passengers are to be transferred thereby causing delay as well as increasing the costs of transport. The goods in transit between Sydney and Perth take about fifteen days but the distance involved may be covered in less than five days. Australian government has set up

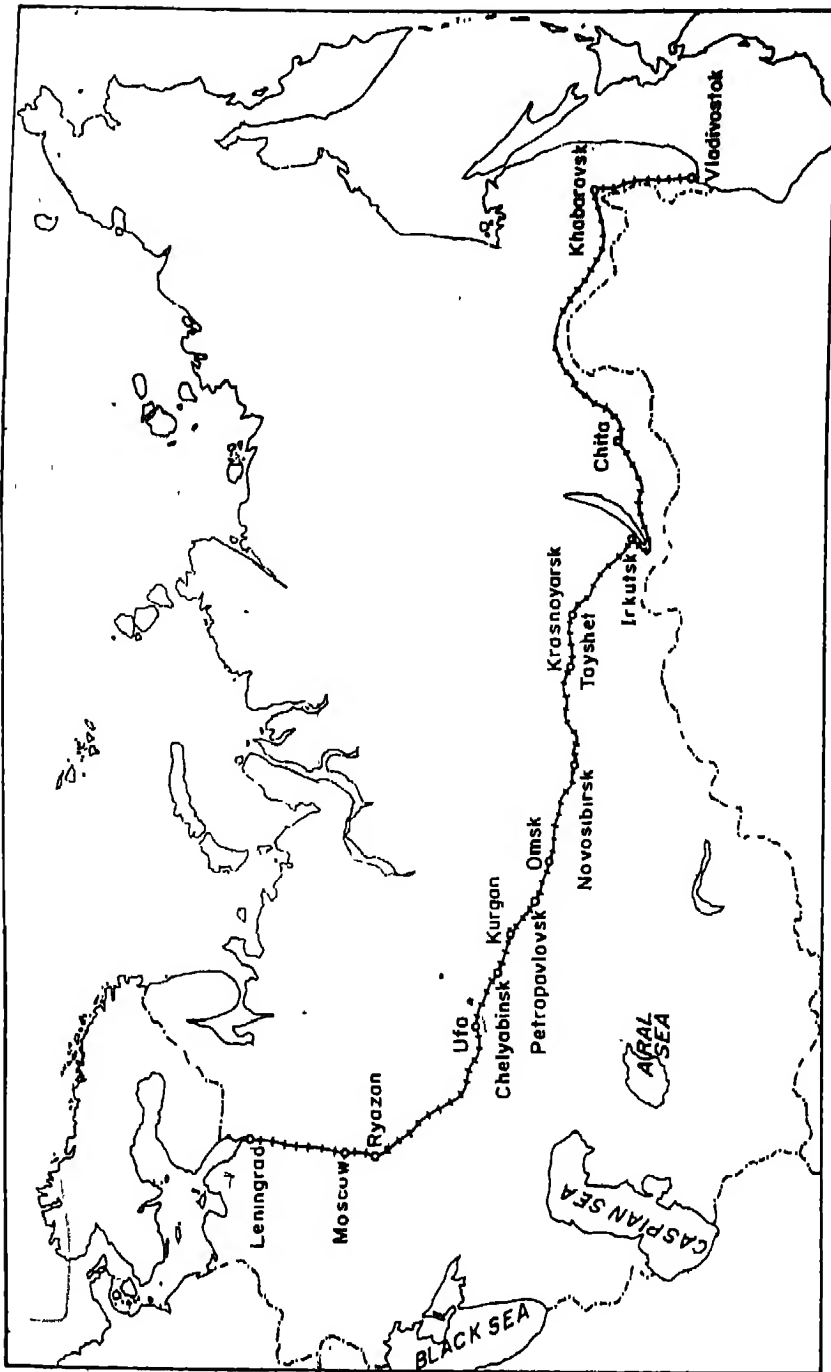


FIG. 11.2 Trans-Siberian railway

a committee known as Rail Standardisation Committee to suggest ways to surmount this difficulty.

There is a proposal to construct a Trans-Continental railway in Africa from Cairo to Cape Town via Aswan, Addis Ababa, Mombasa along the eastern coast to Cape Town. Some of its segments are complete but the whole track will take some time in completion.

WATER TRANSPORT

People have been navigating in oceans, rivers and lakes since ancient times. Water transport is

cheaper than land transport. Therefore, it is cheap to transport heavy cargo through waterways. In modern times, the routes of the ships, port of call and time are pre-decided and the ships follow proper schedule. The development of packing industry has facilitated the oceanic transport. The waterways are divided into two groups; inland waterways and oceanic routes.

Inland Waterways

Rivers and canals are the main medium of waterways on the land surface. Boats and steamers are used in the navigable rivers for transport-

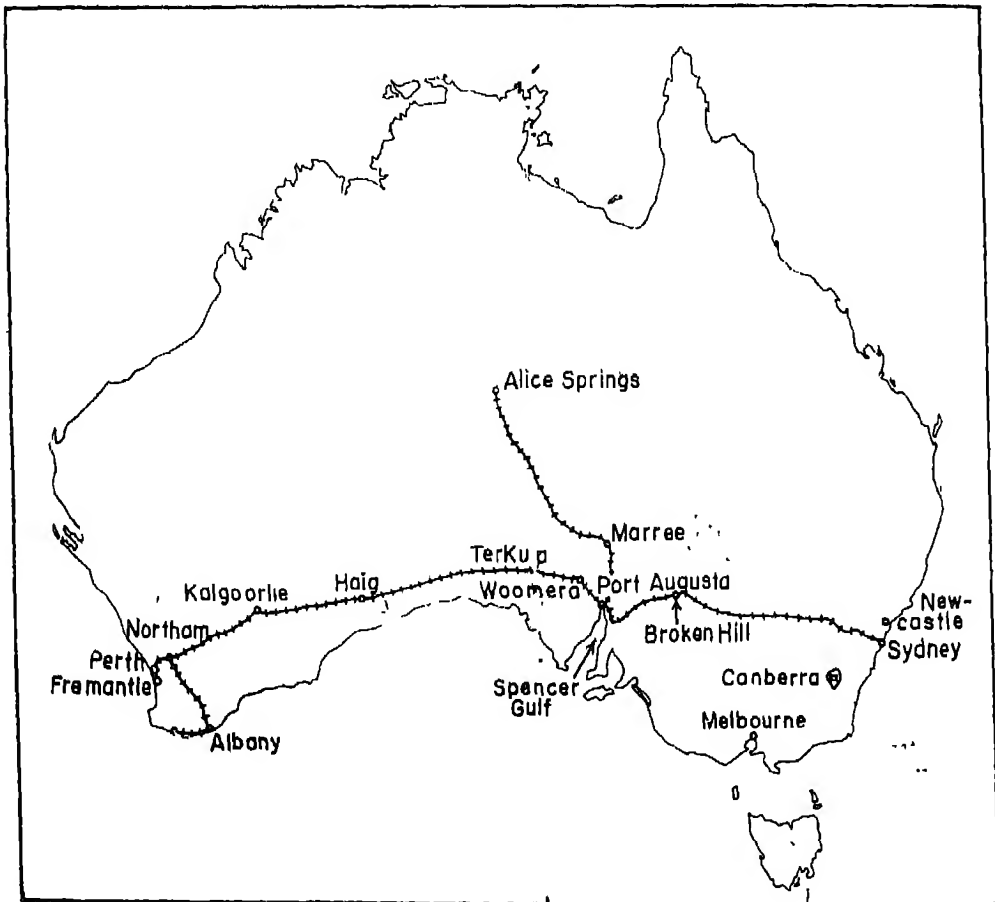


FIG. 11.3 Trans-Australian railway

ing cargo and passengers. The development of inland waterway is dependent on the quantity of water, its depth, continuity in the flow and its width. There are some definite advantages in inland waterways. There is neither any need of laying a track nor it has to be metalled like the highways. Rivers are the only means of transport in dense forests. Very heavy cargo like coal, cement, timber, metallic ores are transported at cheaper rates.

It takes longer time to transport through inland waterways as it is slow. Rivers having waterfalls cannot be used for transport. Canals having different levels require locks to control the level of water for bringing ships from one level to the other. A large amount of capital has to be invested in the construction of canals. The water level in river varies with seasons hence its navigability is affected during dry seasons. It may also freeze during winters and therefore, navigability may be adversely affected. It is difficult to navigate in such rivers which change their courses frequently.

Important Inland Waterways in the World

Although inland water transport is carried the world over its degree varies. It is quite developed in the following regions.

Western and Central Europe

Rivers flowing in the North Sea e.g. Seine, Rhine and Elbe, together with their numerous inter connecting canals, provide a well developed transport network in western Europe. Inland water transport is very important in France, Belgium, Netherlands, and Federal Republic of Germany. Rhine is the most important river of this transport system. Danube and its tributaries provide another important system of inland water transport.

Volga System

Volga system represents a large drainage system

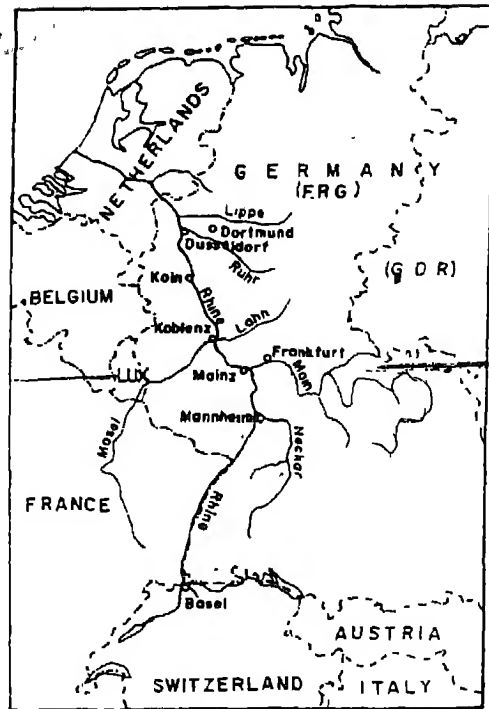


FIG 11.4 Rhine waterway

of the world. It provides a navigable route of 11,200 km. Volga-Moscow canal connects it with the Moscow region. Volga-Don canal provides access to the Black Sea by boats. Volga discharges its water in the Caspian Sea. Don canal provides link between its upper valley region and the Black Sea.

The other rivers of Soviet Union such as Ob, Yenisey and Lena are not important for navigation because they flow in uninhabited region, remain frozen for most part of the year and fall in Arctic Ocean which itself is not important for navigation.

Inland Waterways of China

Navigation is done in Huang, Chang Jiang and

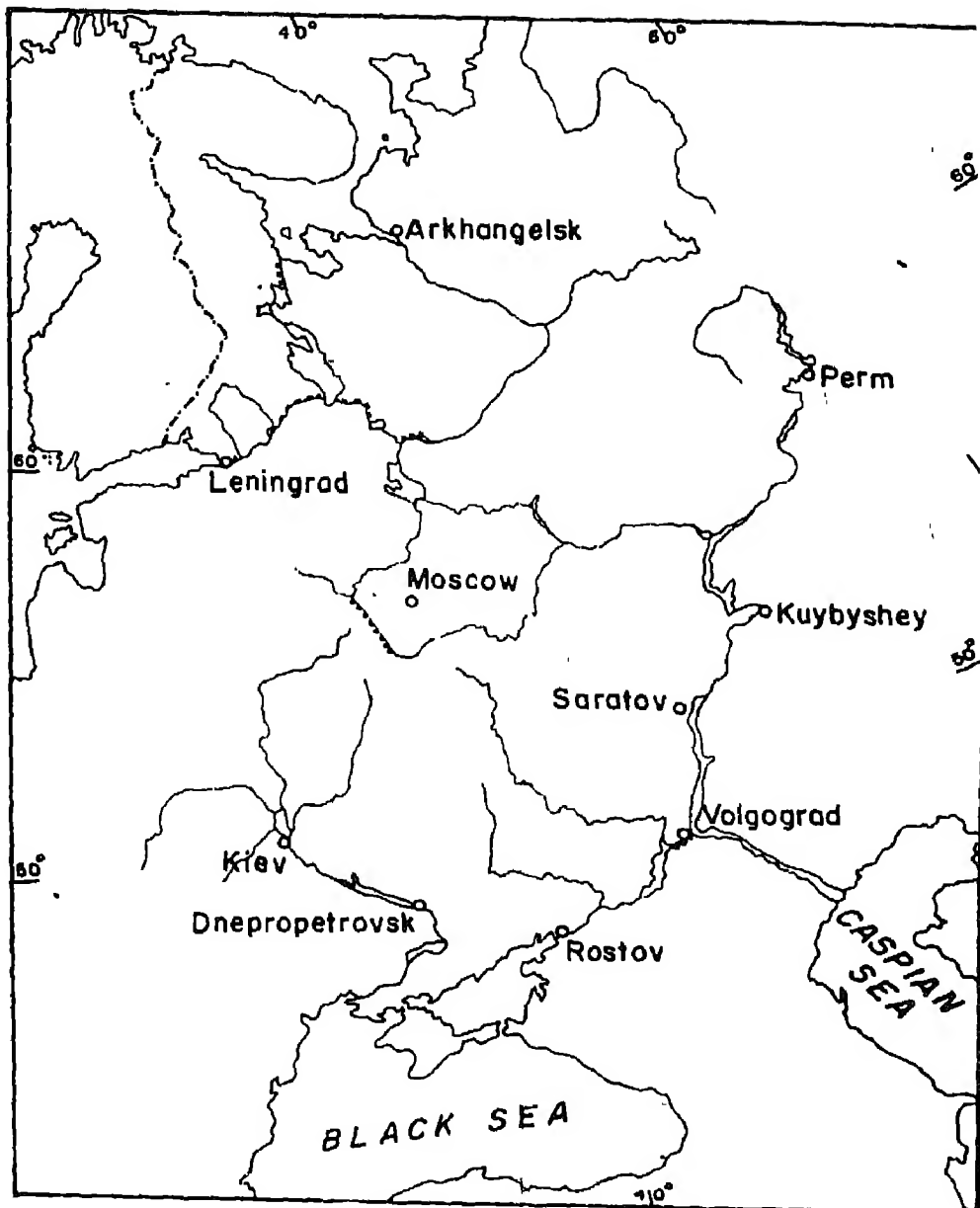


FIG. 11.5 Volga waterway

Si rivers in China but Chang Jiang is very important. It links its delta region with densely populated Sichuan region. Oceanic vessels can reach upto Honkow in this river but boats can reach upto Chung Cheng through the gorge. A very dense network has been developed in the lower valley of Chang Jiang through canals which are navigable.

River Routes in North America

There are two important inland waterways in North America. First, the Great Lakes—St. Lawrence waterway and second, the Mississippi waterways in the south.

The ships can come upto 3,760 km inland

through the Great Lakes—St. Lawrence waterway and the ports of this waterway have developed just like oceanic ports.

The Mississippi can accommodate large steamers upto Minneapolis. The importance of Mississippi-Ohio waterway increased after the second world war. It connects the interior region with the Gulf of Mexico.

Amazon waterway

Amazon is the longest river in the world. Ships can reach Manaus, 1,600 km upstream, while river steamers can ply in the river upto Iquitos in Peru which is 3,680 km from the Atlantic Ocean in the east. Due to the sparseness of population and low level of economic development

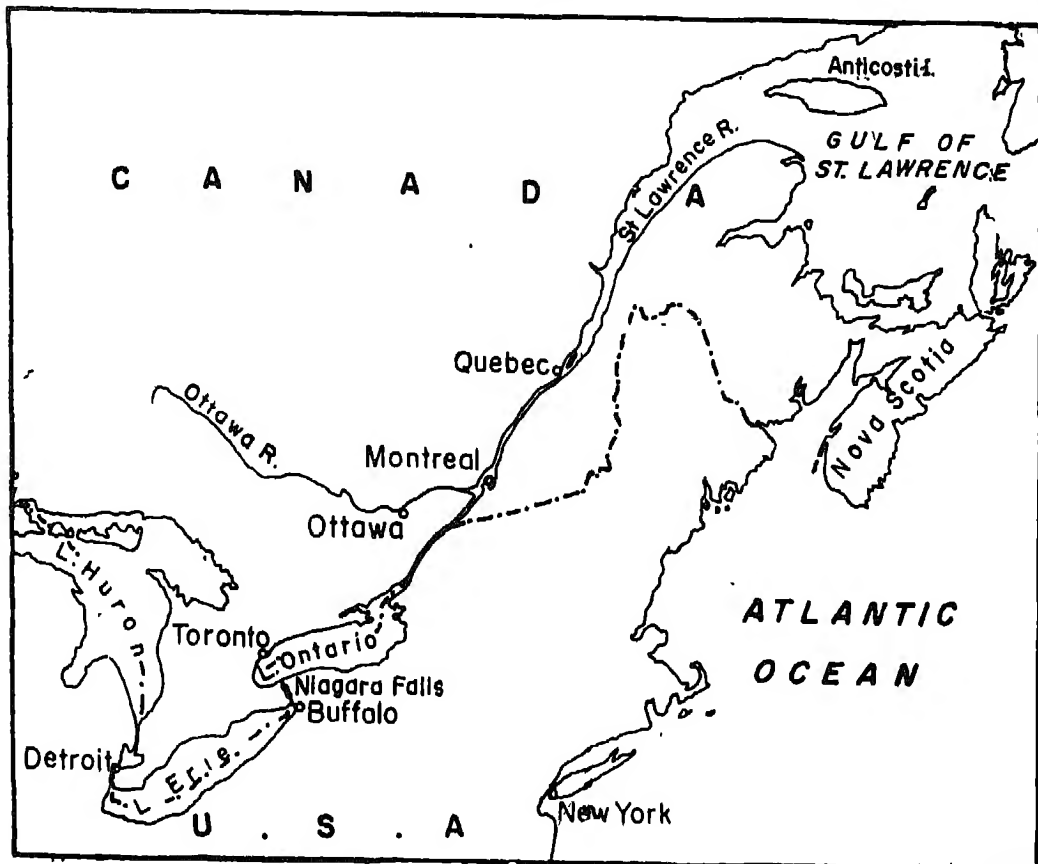


FIG 11.6. St. Lawrence waterway

in the interior this waterway is very little used.

Parana-Paraguay waterway

It is the most important drainage system in South America from the view point of its economic value. Parana is navigable for oceanic vessels upto Santa Fe, about 240 km upstream. River steamers can reach upto Asuncion through Paraguay. This river system discharges its water in the estuary of Rio de la Plata. The absence of delta, thus permits the entry of large ships in the waterway. This waterway is economically important as it flows through comparatively developed region.

Oceanic Routes

Transportation through oceans is cheaper and easier. Except for investing large capital in making ports, no other investment is required. It is easier as there are no physical obstacles except for icebergs, storms and fog. Large ships can carry far greater loads and far greater weights than any other means of transport. Some of the important ocean routes are as the following.

North Atlantic Route

It is the most important and busiest route of the world because it connects the eastern United States and western Europe. Both these regions are industrially developed and international trade is the backbone of their economies. Both the coasts have good port and harbourage facilities. Previously the route was important for handling passengers but now it has become important for transporting cargo in bulk.

Mediterranean and Indian Ocean Route

It is also one of the important oceanic routes in the world. It connects the industrially developed countries of Europe with East Africa, South

Asia and Far East through the Mediterranean Sea, the Red Sea and the Indian Ocean. The east bound cargo consists of machinery and industrial products while raw materials like cotton, rubber and other products such as tea, coffee, sugar and petroleum are sent from eastern areas to Europe. Port Said, Aden, Bombay, Cochin and Colombo are some of the important ports on this route.

The Cape Route

This route provided link between western Europe and Far East, Australia and New Zealand prior to the construction of the Suez canal. Even now this route is used to reach west African countries, South Africa, Australia and New Zealand. Due to low economic development of west African countries enough cargo is not provided and there are not many ports of call. The ships coming from Europe directly head towards the Cape of Good Hope. This route is longer to reach South-East Asia as compared to Suez canal route.

South Atlantic Route

This route connects the western European and west African countries with Brazil, Argentina and Uruguay. The ships coming from Europe bring machinery and industrial goods and from South America raw materials, coffee and other food products are sent to Europe. There is no significant trade between South American and West African countries due to low level of industrial and economic development of these countries.

North Pacific Route

It links the ports on the western coast of North America such as Seattle and San Francisco with the ports of the Far East such as Tokyo and Yokohama. The volume of trade is not very high on this route because there are not many islands enroute. Therefore, there are neither many ports with facilities of refuelling etc. nor much cargo

available along the route.

South Pacific Route

This route is used for carrying out the trade between Australia, New Zealand and North America and Western Europe via Panama canal. An important port on this route is Honolulu. The ships bound to Hongkong, Philippines and Indonesia also use this route.

Suez Canal Route

It is a man-made waterway in Egypt which has been constructed to connect the Mediterranean

with the Red sea. It is the shortest route between western Europe, East Africa, South and South East Asia, Far East and Australia. The construction work of this canal was started in 1854 by a French engineer Ferdinand - de - Lesseps and it was completed in 1869.

The canal separates the lower Nile valley of Egypt from Sinai Peninsula. It is a dry region. Its sandy soils facilitated digging. There are a few marshy lakes in the route of the canal e.g. Manzala in the north, Timsa in the centre and Great Bitter lake in the south. A number of ports have been developed enroute such as Port Said and Port Faud in the north and Port Suez in the south. Ismailia is the major town in the central part

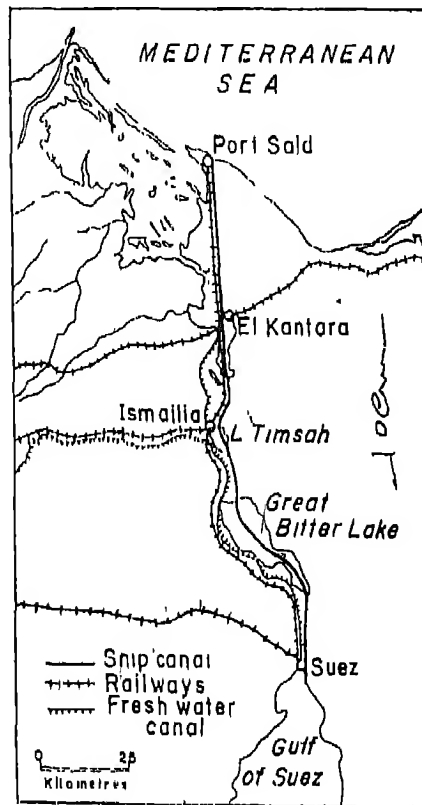


FIG 11.7 Suez waterway

which is located on the Lake Timsa. Besides these, El-Qantara, El-Bulq and El - Kubra are important check posts.

This canal is 168 km long and its maximum width is 365 metres. Its average depth is 16.15 metres. It has two corridors one for east bound ships and the other for west bound ships. It takes

15 hours to cross the canal. About 90 ships cross this canal every day. Due to this canal, the distance as compared to the Cape of Good Hope route has reduced by 9,600 km between London and Bombay, by 5,120 km between Lisbon and Macao and by 10,720 km between New York and Aden.

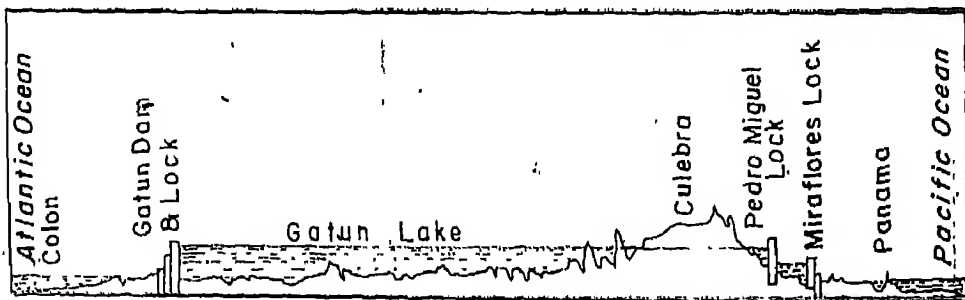
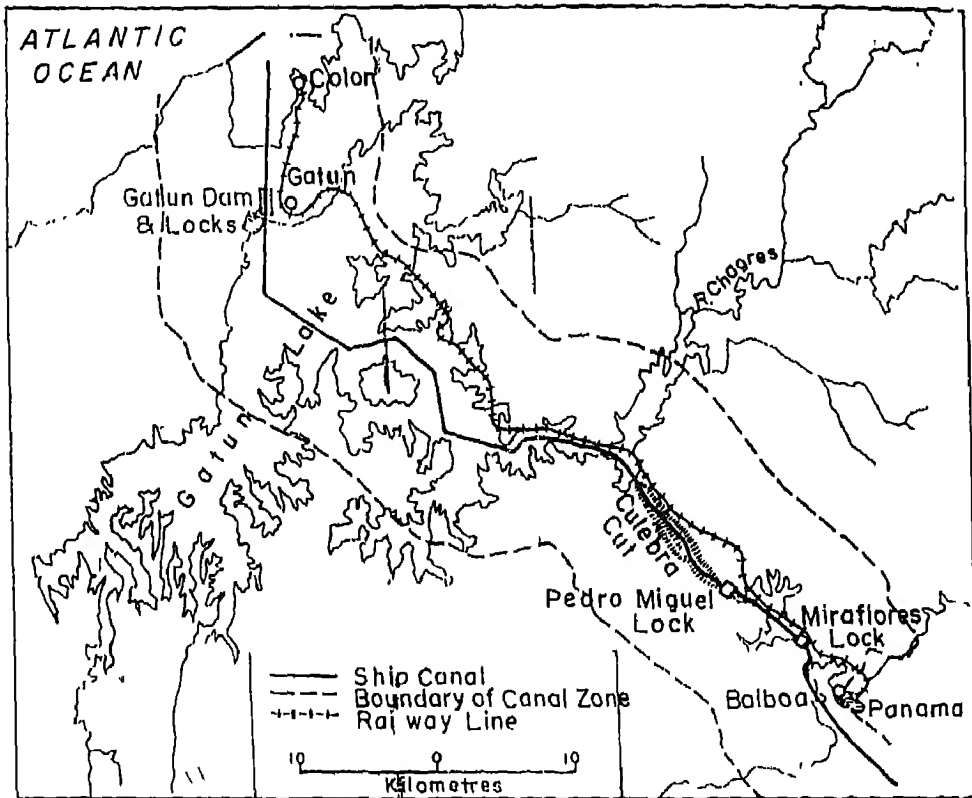


FIG 11.8 Panama waterway

In 1960, 13,985 ships crossed the canal and handled 242 thousand tonnes of cargo. A year before the war between Israel and Egypt i.e. in 1966, the canal had handled 21,250 ships carrying a cargo of 274.3 thousand tonnes. Due to the war this canal was closed between 1967-1975, which badly affected the trade of west European as well as Arab countries. In 1977 the number of ships crossing the canal was 19,700 and the cargo handled was 220.5 thousand tonnes. The Iraq and Iran war during 1980-88 has caused reduction in the numbers of ships crossing the Suez. As such in 1986 only 18,403 ships crossed the canal.

The cargo from south to north consists of food grains, petroleum, metals and ores, timber and timber goods while the south bound cargo consists of machinery, machinery parts, fertilisers, oil seeds and edible oil.

Panama Canal Route

Panama canal route connects the Atlantic in the east with the Pacific in the west. This canal has also reduced the distance between the eastern and western coasts of North and South Americas. It also provides a shorter route between the Far East countries and western European countries. The construction of the canal started in 1906 and it was opened for ships on 15th August 1914. It has been constructed across the Panama isthmus and, therefore, it separates the landmass of North America from that of South America.

The canal measures 64.8 km from the Atlantic coast to the Pacific coast. However its length from the deep waters in the Atlantic to the deep waters in the Pacific is 81.12 km. Its minimum depth is 12.3 metres. About 48 ships can cross it every day. The ships coming from the Atlantic side enter the canal at Colon and those coming from the Pacific side enter at Panama city.

Panama canal is different from Suez Canal as it has a lock system. Ships cross different levels of the canals through locks. The ships coming

from the Atlantic pass through 3 locks. In the Gatun lock, the ships are lifted up in the lock water upto 25.5 metres and then they enter into Gatun lake. After crossing Gatun lake, the ships enter into Gaillard cut, which is about 10 km long waterway. Then the ships are shifted through Pedro Miguel lock to Miraflores lake and then through the Miraflores it enters into Gulf of Panama.

The economic importance of Panama canal is comparatively less than that of the Suez. It has helped in reducing the distance between the ports located on the western coast of North America and ports of Western Europe. For example, the distance between Liverpool and San Francisco has been reduced by 8000 km.

Petroleum, grains, ores and coal comprise the cargo from the Atlantic side and the ships coming from the Pacific side bring copper, nitrate, tin, fruits, Salmon fish and timber. This canal has benefitted the Central American countries most.

AIR TRANSPORT

The air transport has developed during the early twentieth century. The world was induced the accelerated pace of development in the design, size and propulsion mechanism. The speed is the only aspect in which air transport has an advantage over the land and water transport. Its greatest disadvantage is its high cost. Air routes do not face the type of obstacles present on the ground. These crafts have the freedom of speed in the air. However, they do face certain obstacles. They have to follow a particular route as different countries allow these flights only through a corridor.

Aircrafts require similar facilities at airports as ships require at harbours. These airports, besides providing landing facilities, should also provide fuelling and maintenance facilities. The air transport is adversely affected by bad weather conditions. The rainfall, storm or fog obstruct the

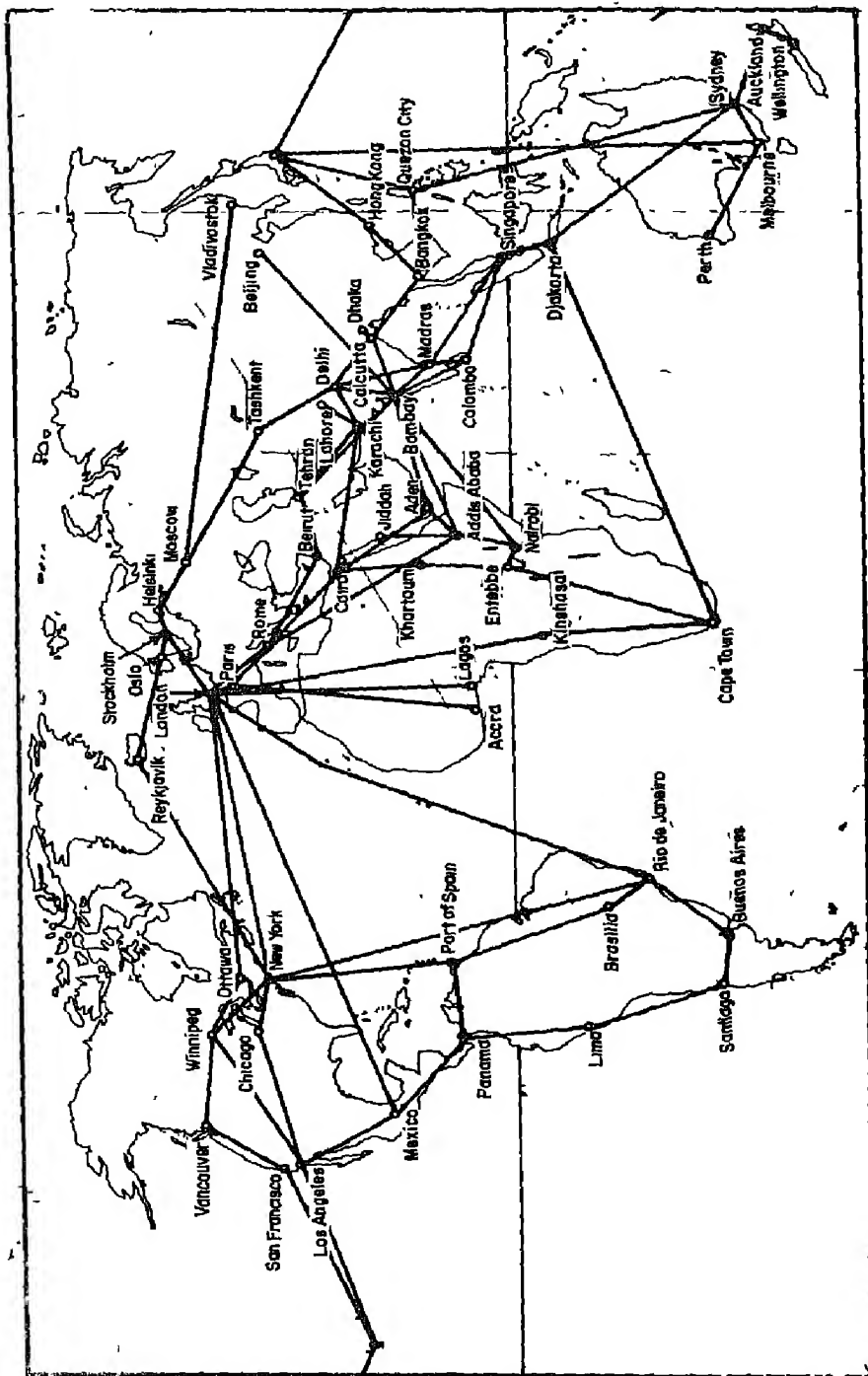


FIG 11.9 World—Major air-routes

landing and take off of the aircraft. When planes were of smaller size they were unable to carry sufficient fuel and hence it was difficult for them to cross large ocean bodies, deserts and hilly areas. Now such limitations have been overcome by the technological improvement of the aircrafts. Some of the aircrafts can now fly even under bad weather conditions. Generally aircrafts fly in stratosphere i.e. above the troposphere and hence they remain unaffected by the weather conditions. But the adverse effects of low clouds, fog, mist and dust storms cannot be entirely ruled out because they affect the visibility.

Air routes are delineated on the basis of two factors. Firstly, the provision of facilities for controlling the flight on the ground e.g. airport, meteorological information services, technical inspection and proper maintenance services. Secondly, the availability of sufficient number of passengers and cargo. If there are neither passengers nor cargo the service becomes uneconomic.

There has been during past few decades, a remarkable improvement in the size of the aircrafts and speed e.g. Jumbo Jets and Concord. But the air transport is still very costly. Generally light and valuable articles such as letters and records, jewels, diamonds and perishable commodities such as flowers are sent by planes. It is a very useful means of transport in mountainous and hilly region where construction of roads and railway is difficult and also during emergency.

Air services are of two types: Domestic and International. There are some special features of the air transport. A very dense network of air routes exists in Western Europe, Eastern United States of America, and South-East Asia. There are some nodal points from where the air routes radiate in all directions e.g. London, Paris, Rome, Moscow, Karachi, New Delhi, Bombay, Bangkok, Singapore, Tokyo, San Francisco, Los Angeles, Chicago, New York and Rio de Janeiro etc. Soviet Asia and Africa lack air services. There

is a distinct belt of air routes from east to west in the Northern Hemisphere.

Airports and their Construction

Airports play a very crucial role in air operations. The construction of airports requires large capital investment. It requires large open space. Efficient transport facilities from the airport to the city and vice-versa as well as the presence of an economically developed region from where passengers and cargo are available, are other important factors in siting the airport. These should be located away from densely populated areas so that people are not affected by accident and noise pollution. The smoke from the chimneys of the city should not come to the airport otherwise the smog and fog may affect visibility. Nowadays security of the passengers and the craft has become a problem in view of the frequent hijacking of the planes. The airport should therefore, be provided with adequate security measures.

Pipelines

Transportation of materials other than drinking water through pipelines is a comparatively new method. Municipalities used to supply water through pipelines. For many decades, the pipelines have been used for transporting crude oil from wells to the refineries. There is a dense network of pipelines in United States of America for carrying petroleum from the regions of production to the regions of consumption. One of the important pipelines is the 'Big Inch' which carries oil from the wells of the Gulf of Mexico to the north eastern part of the U.S. From Iran, Iraq and South Arabia is also brought through pipelines to the Mediterranean coast. Among them the biggest pipeline is known as 'Tap-line' which has a diameter of 750 mm. This pipeline connects the wells of American Oil Company located near the Persian Gulf with the Sidan refinery located at

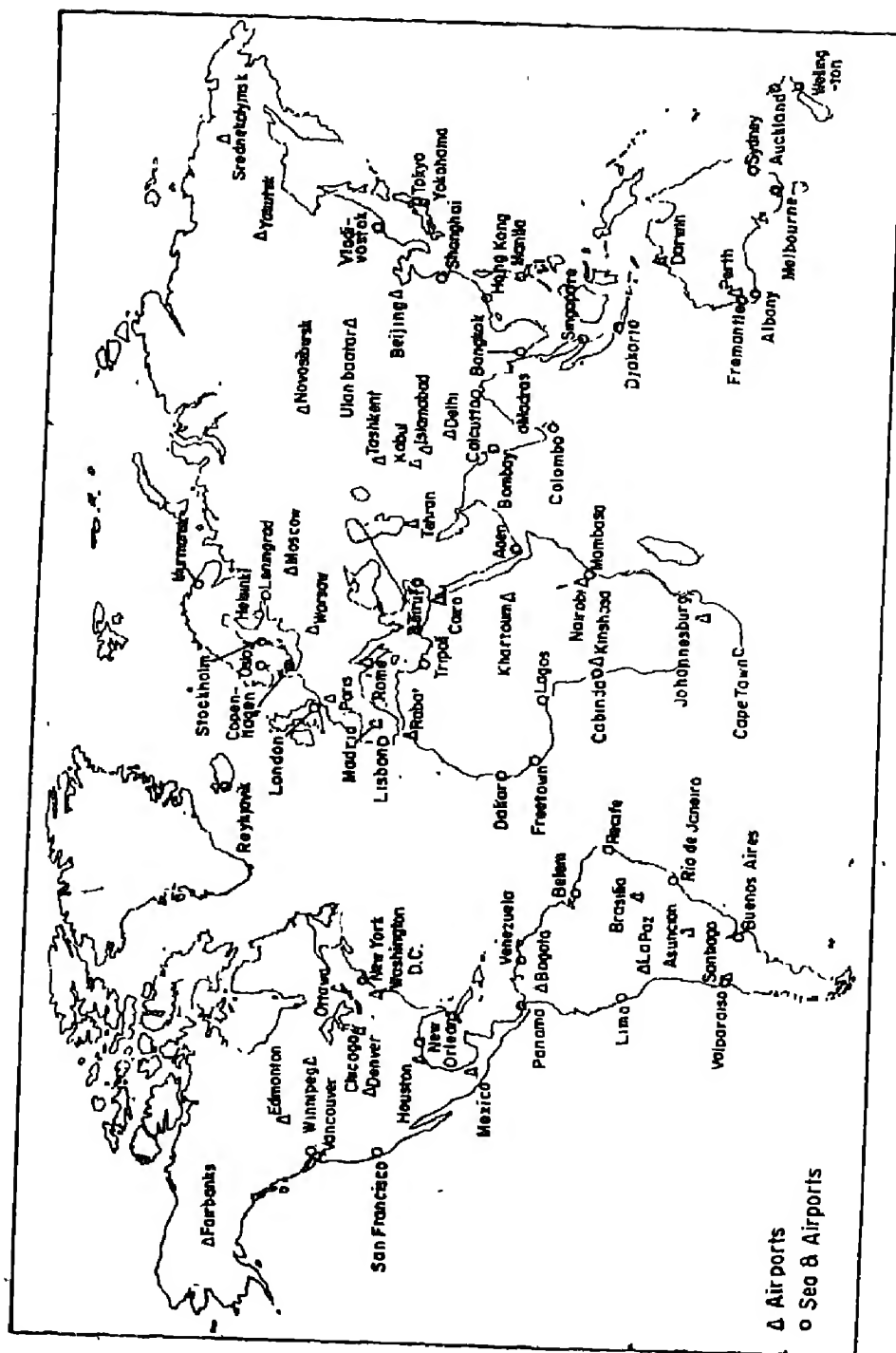


FIG. 11.10 World—Major airports and seaports

a distance of 1,600 km. One of the longest pipeline is the trans-continental 'COMECON' pipeline. It is 4,800 kms. long. It was built by the Soviet Union to carry crude oil from the wells of Ural and the Volga regions to the East European countries.

Gas is also transported from one place to the other through pipelines. In United States of America, the length of gas pipelines is more than railway lines. Gas is transported through pipelines in Italy, France and Netherlands. In Soviet Union, 17 lakh km long pipelines have been constructed to carry gas.

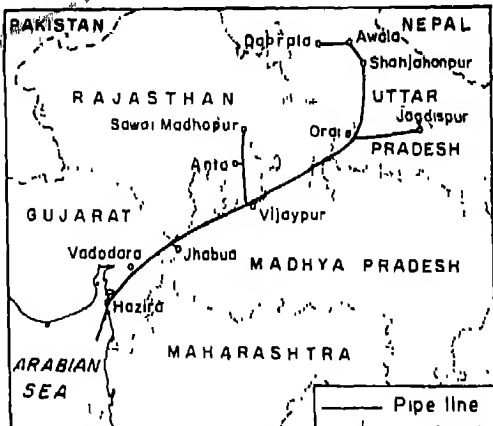


FIG 14.11 HBJ Pipeline

In India oil from Kandla port is transported to Mathura refinery through a pipeline. Recently, a pipeline between Hazira-Bijapur and Jagdishpur (HBJ) has been constructed to transport natural gas. This pipeline covers a distance of 1700 km, of which 343.7 km is on stony surface and 56.3 km is through forests. The gas transported through this pipeline will be used for producing fertilisers at Bijapur, Sawai Madhopur, Jagdishpur, Shahjahanpur, Anwala and Babrala.

COMMUNICATION

Man has adopted different means of communication over time. The message was delivered by beating the drum or hollow tree trunks, making

indications through fire or smoke or through fast runners. Horses, camels and other animals were also used to send messages but mostly the means of communication were also the means of transportation. Telegraph was developed by Samuel Morse in 1844 and this invention revolutionised the communication. Printing press created the possibility of printing and thus newspaper and magazines also served the purpose of communication. Graham Bell invented telephone which made the communication much easier. The development of radio by Marconi introduced a wireless medium in communications. Any message can be transmitted throughout the world simultaneously by the medium of radio. Besides audio mediums, video mediums such as television have also been introduced. It is, however being used more for recreation. The modern science and technology has been able to develop telegraph, telephone, radio, television, radar and satellites and thus the distances in the world have greatly been reduced.

Satellite Communication

United States of America and Soviet Union have been pioneers in space research. They successfully launched space-crafts which threw new light on scientific facts and thus means of communications were revolutionised. The efforts made in space research in India are oriented towards the development of communications and television so that people can be reached through these mediums. India embarked on the path of developing satellite technology by launching Aryabhata on 19th April 1975 from the Soviet Union with the help of its Intercosmos rocket. Bhaskar-1 was sent into the space on 7th June 1979 and on 18th July, 1980, Rohini was launched from the Indian Cosmodrome at Shri Harikota.

On 19th June 1981 APPLE (Arian Passenger Payload Experiment) satellite was launched through Arian rocket. Bhaskar-2 was sent into the space on 20th November 1981 which was

also a remote sensing satellite INSAT 1-A was launched on 10th April 1982 but in September the same year it stopped working. Thus on 30th August 1983 INSAT 1-B was sent to space through space shuttle, Challenger. INSAT 1-B has made radio, television, and long distance

communication very efficient and effective. Now we receive information about the weather on television and forecasting about storm etc. is done effectively. Telephone, telex and fax have also facilitated communication to a great extent.

EXERCISES

Review Questions

1. Answer the following questions briefly.
 - (i) Why is the road transport easier?
 - (ii) Write an essay on the economic importance of Trans-Siberian Railway.
 - (iii) Discuss the advantages and disadvantage of inland water transport.
 - (iv) Write a comparative account of the economic importance of the Panama and the Suez Canals.
 - (v) Compare and contrast the North and South Atlantic Ocean routes.
 - (vi) Write a note on the development of satellite communication in India.
2. Differentiate between.
 - (i) Transport and communication
 - (ii) National and State highways

Cartographic Work

3. Show the following on the map of the world.
 - (i) Trans-Siberian and Canadian-Pacific railways
 - (ii) Panama and Suez Canals
 - (iii) New York, London, Cape Town, Bombay, Singapore and Perth.
 - (iv) Oceanic route from Bombay to London
 - (v) Tap-line and HBJ pipelines.

CHAPTER 12

International Trade

EXCHANGE of goods and services among different countries is known as international trade. It is the barometer of the economic development of a country. International trade is mutually beneficial to the trading countries. The tradition of trade between countries is quite old. You may be aware of the 'silk route' between China and South-West Asia which was a land route. The caravans travelling on this route used to trade in silk, condiments and iron wares. The Arabs had close trade links with South and South-East Asia. Ancient Indians used the Bay of Bengal and the Arabian Sea to establish their trade relations with the countries of West Asia, Africa and South East Asia. Tobacco, potato and tomato were introduced in India through international trade. These are crops of temperate regions and the traders brought it to India. The Indian traders became the harbingers to spread the Indian civilisation in South-East Asia and other regions. Thus, international trade is not only economically important but also culturally important.

The Bases of International Trade

All the countries have not been endowed with similar natural resources. There are variations in relief, structure, geology, climate and soil from one country to the other. These variations result in the variations of natural resources. Some countries have certain resources more than what they

require while others may lack the same resources. Thus, the variations in the availability of natural resources among different countries is one of the important basis of international trade.

Few countries because of their advanced and efficient technology produce more than what they require for their own internal consumption. In other words, these countries have marketable surplus, which they trade with those countries having demand for such products. For example, Saudi Arabia has more oil than her own need whereas production of oil in Japan is not sufficient. Therefore, Saudi Arabia sells oil to Japan as well as to all those countries which need it. In the same way wheat from Canada, meat from Argentina, fish from Japan and tea from India are available for international trade. It is true that marketable surplus is a condition for trade but there are some exceptions too. For example, some countries export such materials for which there is a great domestic demand but they are exported to earn foreign exchange. Sometimes, the demand for a specific commodity or desire for the items of comforts and luxuries also become the basis for international trade.

Development technology is the basis of developed economies. On contrary developing economies have a low level of technology. Hence the demand for raw materials in the developed economies and the demand for industrial goods in developing countries is another basis of international trade. Some countries attain specialisation

tion in specific products e.g. silk in Japan and China, carpets in Iran and handicrafts in India. The demand for such articles was the basis of international trade earlier but now their importance is gradually declining.

Development of transportation has also facilitated international trade but it is also true vice versa.

Important social bases for international trade are peace and political stability in the nations. International trade gets disrupted during the time of war. Peace is an important condition for international trade. It is also greatly influenced by the policies of different governments.

Recent Trends in International Trade

The nature of the international trade has changed significantly in the modern times. In ancient time, the traders used to go from one country to the other with their goods for sale such as silk, precious stones, diamonds, jewels, gold, and horses etc. In those days, the goods entering into international trade were mainly luxury goods. Tea, coffee and sugar were also considered to be items of luxury. After the industrial revolution the nature of the international trade was transformed. Items of import and export consisted of raw materials such as ores, cotton, chemicals, timber, food items e.g. foodgrains, meat, milk, sugar, and beverages e.g. coffee or tea. Most of the industrial countries of Europe laid more emphasis on industrial production and met their food requirements through imports as it was cheaper. For example, the agricultural production in United Kingdom went down after industrial revolution, because the labour shifted from agriculture to industry where wages were higher.

Thus there emerged an international trade in the world in which the tropical regions started exporting the primary products e.g. grains, vegetable oil, rubber, minerals, tea and coffee etc. to the temperate regions. They, on the other hand, imported from temperate regions items of indu-

ustrial production such as machinery, cars, clothes and chemical products. After independence, countries of the tropical region are developing their industries. It is now affecting the nature of international trade again. The developing countries are also coming up in the export of industrial goods.

Every country of the world imports as well as exports certain items or services. The difference between the value of a nation's exports and imports of all goods and services over a given period of time is called balance of trade. If the value of the total export is more than the value of the total import in a country, it has a positive balance of trade. If the value of exports is lower than the value of imports, the country has a negative balance of trade. The country with positive balance of trade are known as *trade creditor nations* and those with negative balance of trade are known as *trade debtor nations*.

The important trends in international trade have been represented by diagrams.

These diagrams clearly show that even in the developed economies the imports are more than exports. It means that these economies also have a negative balance of trade. In developing economies, there has been positive balance of trade from 1982 to 1987 except during 1986. Centrally planned economies have also shown a tendency of negative balance of trade after 1985. India imported items worth Rs. 17 thousand crores and 20 thousand crores during 1984-85 and 85-86 respectively while the value of its exports was Rs. 12 thousand crores and 11 thousand crores in the same years. It means, in both the years, the value of export is less than the value of imports.

A very significant trend in international trade is the formation of trade associations and clubs e.g., OPEC, EEC, EFTA, and COMECON etc.

Organisation of Petroleum Exporting Countries: (OPEC):

There are 13 countries which are members of this organisation. These are Algeria, Ecuador, Gabon, Indonesia, Iran, Kuwait, Libya, Nigeria,

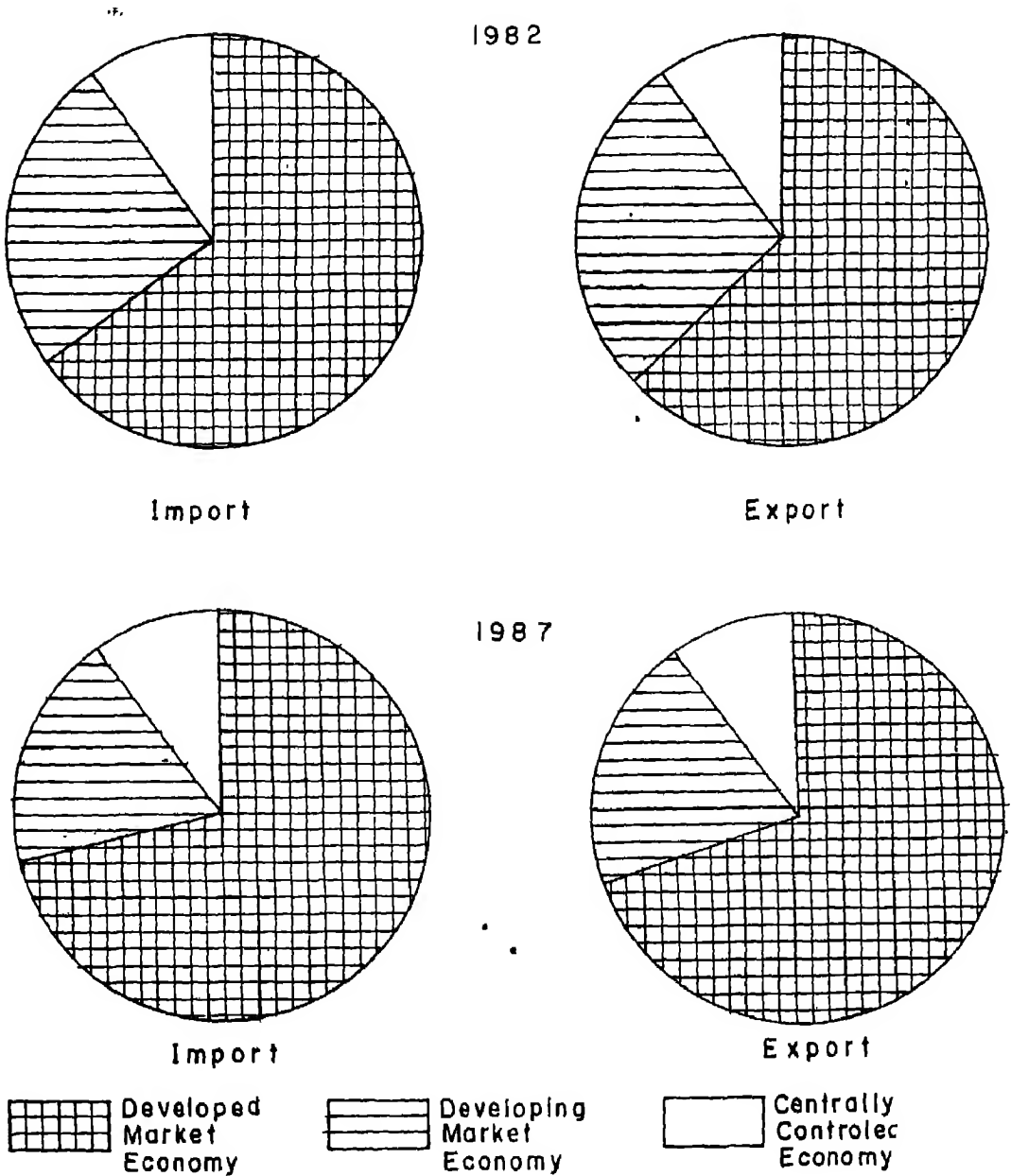


FIG 121 *Important trends of international trade*

Qatar, Saudi Arabia, United Arab Emirates and Venezuela. This organisation was formed in 1960 to decide the policies regarding petroleum.

European Economic Community: (EEC)

This organisation was formed under the Treaty of Rome in 1957 by six countries. These were France, Belgium, Luxembourg, Netherlands, Federal Republic of Germany and Italy. The main objective of this organisation was to abolish the trade restrictions within the member countries. United Kingdom, Denmark and Irish Republic also joined EEC in January 1973.

European Free Trade Association: (EFTA)

In 1960 seven countries i.e. United Kingdom, Austria, Denmark, Norway, Sweden, Portugal and Switzerland, joined together to form EFTA. Its objective also was to bring about cooperation in the field of trade. They abolished the tariff between different member countries. In December 1972 United Kingdom and Denmark abandoned their membership and joined EEC while Iceland joined this Association and Finland accepted its co-membership. Now again there are seven members.

Council of Mutual Economic Cooperation: (COMECON)

It is an association of centrally planned economies in which the east European countries such as Bulgaria, Czechoslovakia, German Democratic Republic, Hungary, Poland, Romania and Soviet Union are the members. The trade policies are determined within the national economic frame.

Ports — the Gateway of International Trade:

Port is that place on the coast where cargo in large quantity is received from oceanic routes and

sent to the interior of the country through land routes and vice versa. It acts as a point of entry for the goods received from foreign countries and a point of exit for the goods produced in its hinterland. The quantity of cargo handled by a port is an index which reflects the level of development of its hinterland. The main function of the port is to send the ocean bound or the land bound cargo efficiently. Its significance is judged by the size of cargo and the number of ships handled. The ports have arrangements for loading and unloading of cargo. Thus the ports provide certain facilities such as docking facilities, loading and unloading facilities, the storage facilities for cargo etc. In order to provide these facilities, the port authority makes arrangements for maintaining the navigable channel, arranging tugs and barges, and providing labour and managerial services.

Port is only a part of a coast town. These are differentiated by the specialisation of the tasks which they perform. On this basis, ports are of the following types.

Passenger Ports

These are the ports of passenger liners and are concerned with passenger traffic. They have good rail and road connection with the interior parts to transport the passengers safely. Bombay, London and New York are the examples of such ports.

Commercial Ports

These basically handle the goods for imports and exports though they may have some passenger liners also. Some fishing ships also may come to such ports.

Entrepot Ports

These are collection centres where the goods are brought from different countries to be sent to others besides their own country for example Singapore is an entrepot for Asia, Rotterdam for

Europe, and Copenhagen for the Baltic region. Since the destination of cargo is another country, it is stored in large godowns and transported to its proper destination.

Out Ports

These are deep water ports built away from the actual port in the deep waters of the ocean. These serve the parent port by receiving those ships which are unable to approach it due to their large size or silting. A number of such ports are found in Europe, for example, Avonmouth, is the out-port of Bristol, St. Nazaire for Nantes, and Bremen-haven for Bremen.

Packet Stations

They are also known as *ferry ports*. These are exclusively concerned with the transportation of ~~passengers and mail over short sea passages~~. Packet stations occur in pairs located in such a way that they face each other across the water body e.g. Dover in England and Calais in France across English Channel. They have derived this from the name of the small ships known as 'Packets' used to carry mail as well as short distance passengers.

Inland Ports

These are located away from the sea coast towards the interior but are linked with the sea by a river or a canal. Such ports are accessible to only certain types of ships with the help of

barges. For example, Manchester has been converted as a port by linking it with a canal. Memphis on river Mississippi, Mannheim and Duisburg on Rhine, Honkew on Chang Jiang and Calcutta on Hooghly are good examples of such ports

Naval Ports

These ports have strategic importance rather than commercial importance. They serve as bases for ships of war and have repair workshops for those ships. Unlike other ports, their hinterland is of little significance. Cochin and Karwar are the examples of such ports in India.

Port of Call

Many ports originally developed as calling points on main sea routes where ships used to anchor for refuelling, watering and taking food item. Later on they developed into commercial ports. Aden is a very good example of such port. Honolulu and Singapore may be cited as other examples.

Oil Ports

A new type of ports have emerged in recent years. Such ports deal in the processing and shipping of oil. Some of these are tanker ports and some are refinery ports. Maracaibo in Venezuela, Es-Skhiria in Tunisia, Tripoli in Lebanon are tanker ports while Abadan on the Gulf of Persia is a refinery port.

EXERCISES

Review Questions

1. Answer the following questions:

- (i) "International trade is beneficial to both, exporting and importing countries" Discuss.

- (ii) Discuss the bases of international trade
- (iii) What are the main trends in international trade? Discuss critically.
- (iv) How many types of ports are there? Discuss each of them briefly.

2. Write notes on:

- (i) OPEC
- (ii) EEC
- (iii) EFTA
- (iv) COMECON.

Cartographic Work

- 3. Show the major ports on a world map.
- 4. Show the following on the map of India. Kandla, Cochin, Karwar, Vishakhapatnam, Haldia, Paradeep, Mazagaon, and Marmagao

CHAPTER 13

Population

HUMAN beings are the central theme in the subject matter of human geography. In the earlier chapters we have studied man as a producer, creator and consumer. He utilises the natural resources, and in doing so, he influences the environment. He has a tremendous capacity to adjust. No human being is free from the influence of nature and no part of this earth is untouched by human beings. Therefore, it is important to study distribution of population, spatial pattern of its density and growth as well as the demographic structure.

Density of Population and Its Distribution

The world can be divided into three segments on the basis of the density of population i.e. the areas of high density, medium density and low density

Areas of High Density

There are four regions of high density of population in the world. These are, China and the Far East, South and South East Asia, Europe and European part of Soviet Union, and the eastern coastal plain of North America.

China and the Far East

China and other countries of the Far East such as Japan, Korea, Philippines etc. accommodate about one fourth of the total population of the

world. In Japan, which is a small country 11.9 crore people live over 3.7 lakh sq. km. of area. It has an average density of 320 persons per sq. km. but the actual land area under the occupancy of people is even smaller. Thus, the actual density of population is much higher.

In China, high density of population is confined to the eastern coastal belt from north to south. Besides, the northern plain of China, Chang basin and Sichuan are also densely populated region. The highest density of population is recorded on the islands located near the mainland of China. There is a great pressure of population on cultivated lands in these countries and, therefore, people in large numbers have emigrated from here. People from China have migrated and settled in most of the countries of South-East Asia.

South and South East Asia

South Asia includes India, Sri Lanka, Bangladesh, Bhutan, Nepal and Pakistan etc. This region has an average density of 153 persons per sq. km. but if each country is taken individually, the density of population in many countries is much higher than the average. For example, the population densities in Bangladesh and India are 672 and 227 persons per sq. km. respectively. The population density in India is high in the coastal plains and fertile river valleys but the plateaus, mountains and desert regions are thinly populated.

In comparison to India and Bangladesh, Pakistan has lower density of population (117 persons per sq. km.) but there too, Punjab and Sind have higher density while Baluchistan and North West Frontier Province have low density. It shows that higher densities of population are associated with better economic opportunities.

Burma, Malaysia, Indonesia, Thailand, Cambodia, Singapore and Vietnam etc. are the countries of South East Asia. Most of these countries have high density of population. Highest density is recorded in Singapore where 4,353 persons live per sq. km. Likewise Java also has very high density of population. It is mainly because of its fertile soil.

Europe and European Part of Soviet Union

16.1 percent of the total population of the world is found in this region. In the European part of USSR the population density is 99 persons per sq. km. Southern and Eastern Europe have densities of 108 and 113 persons per sq. km. respectively. Northern Europe records a comparatively lower density i.e. 50 persons per sq. km. The high population concentration in Europe may be explained by the industrial development of different countries.

Eastern Coastal Region of North America

The population map of North America gives the impression that the countries here are thinly populated but there has been great concentration of population on the eastern coastal part of United States of America and Canada. The main reason for this concentration is that the immigrants from Europe came and settled first in this part of North America. Hence it experienced an early development of urbanisation and industrialisation. The mining and industrial development provided increasing economic opportunities which attracted more and more people. The spread of population to the west of Appalachian ranges

took place at a later stage. Therefore, the density of population in coastal part is higher.

Areas of Medium Density

The areas of medium density of population in the world are not found in a continuous belt. These are found in those regions between the high and low density population areas, where favourable economic opportunities attracted people and thus the density increased, for example, Delta region of the Nile Valley, the Mediterranean coastal part of Morocco, Algeria, Tunisia in North Africa, the Mediterranean coast of Asia, plains of the Tigris and the Euphrates, Mazendran and Gilan plains on the Caspian coast in Iran and Soviet Central Asia. There are a few such belts of medium density in the coastal areas of South America. The Brazilian coast to the south of the Amazon, coastal areas of Argentina, Venezuela and Chile have such concentrations. The development of irrigation, expansion of mining activity or the development of industry are some of the reasons causing increase in the density of population.

Areas of Low Density

The most extensive part with low density of population is located in Africa and Asia. This thinly populated region extends from western margins of Sahara in the west to the eastern margins of the desert, plateaus and the mountainous regions of Central Asia across Saudi Arabia, plateau of Iran and Afghanistan. This vast area extending over roughly 16 thousand sq. km. has a low density of population except for a few pockets where density is slightly higher.

Northern parts of Eurasia is extremely cold. This region extends from the Scandinavian coast to the East Siberian coast. The density of population is very low. The northern part of Canada is also very cold and hence low density of population. This region has been settled by *Eskimos*, *Lapps* live in the Tundra region of Eurasia.

Other regions of low density of population are the Amazon basin, South West Africa, Northern Mexico, the Zaire basin, Western Australia, the southern peninsular part of South America (Patagonia) etc. The conditions of the physical environment are not favourable for human concentration. The environmental factors have imposed serious limitations in the development of resources for human subsistence. Therefore, the population in these areas is very sparse.

FACTORS INFLUENCING THE DISTRIBUTION OF POPULATION

People settle in those areas where physical conditions do not impose restrictions and they are able to earn their livelihood. Many factors combine together to influence the distribution of population.

Physical Factors

A number of physical factors influence the distribution of population. Accessibility, relief features, climate, natural vegetation, soils and availability of water are important.

Man has reached various parts of the world with the help of different means of transport. Man was unable to reach inaccessible areas e.g. forests, islands and mountains for a long period. Amazonian forests are still inaccessible. New Zealand was not settled till people reached there by boats. Thus inaccessible areas are still without population.

High mountain ranges and rugged terrain restrict the human settlements. Many parts of the Himalayas, the Andes and the Rockies are without any population. Main reasons for the absence of human settlements are rugged terrain, absence of deep soil cover, adverse weather conditions and inaccessibility.

Climate has a direct influence on human health. Excessive heat, cold or dryness restrict the human population. Even the success of crops

depends on climate. Adverse weather conditions cause crop failure, and man cannot survive without food. Climate is responsible for specific diseases in different regions and they impose limitation on human numbers.

Very dense and inaccessible forests also do not encourage the concentration of human population. The selvas of equatorial region are so dense and extensive that man has not been able to establish large settlements in these forests.

Climate and natural vegetation have direct influence on the soils. Actually two of the important factors of pedogenesis are climatic and biotic life forms. Man occupied the most fertile soils first and then moved on to less fertile soils for cultivation. The development of ancient civilisations of the Nile, Mesopotamia, Indo-Gangetic plain and Wei Ho valleys bear testimony to this fact. Higher density of population in Java as compared to Sumatra is attributed to the high fertility of soils.

Human beings, animals, birds and plants depend upon water. Man can occupy even the driest part of the world provided there is water for domestic use and irrigation.

Mineral resources also have attracted human concentrations. The coal mining areas were dotted with human settlements. The gold mines of Kalgoorlie and Coolgardie attracted people to this dry and desolate desert where man would never have thought of settling. Similarly man has also reached to the copper mines of Chuquibambilla on the Andes located at an altitude of 3000 metres. The main reason for the development of Uranium city in the desolate and cold northern Canada is the availability of uranium.

Social and Cultural Factors

The migration of some cultural or social groups from one region to the other, out migration and transfer of population due to political decision are some of the social factors influencing population distribution. There have been periods in

human history when some social or cultural groups were forcibly dislodged from their homelands. The wars fought in the name of religion have forced people to migrate from one place to the other. The Jewish population dwindled in Europe during Hitler's time due to atrocities on them. But their population in Israel increased from 84 thousand in 1922 to more than 20 lakhs with the formation of Israel as a nation. This has resulted in displacement of Palestinian population. The partition of India and Pakistan was a political decision but as a consequence thousands of people moved across the borders. The apartheid policy of South Africa has influenced the distribution of population in that part of the world.

The economic policies of different countries cause migration of labour from one part of the world to the other. The Indian labour was taken to Mauritius, Trinidad and Fizi under the colonial economic policies. The Africans were taken to many countries of America either as labour or slaves.

Population Growth

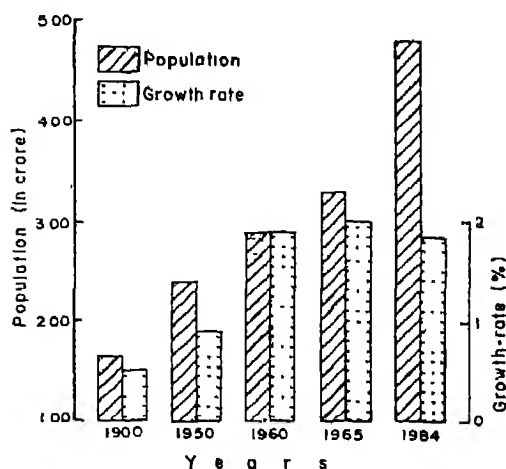


FIG. 13.1 World—growth of population

Fig.13.1 represents the pattern of population growth. Examine the diagram and give the total population of the world in 1900 and 1984. What has been the rate of population growth during this period? Which year has recorded the maximum population growth rate?

The population growth rate has not been similar throughout the world. The growth rate has been slow earlier but is quite rapid during the later periods. Growth rates of population also vary among different regions of the world. This fact is clearly reflected in the table 13.1

Observe the main characteristics of the population growth presented in the table. What is the population growth rate in America, Asia and Oceania? Find out the growth rates in North America and Latin America separately. Why does the rate between two regions differ? You can notice that the growth rate of population in Europe has been 0.3 percent per annum and in North America it has been 0.9 percent per annum. It seems that the population growth is lower in developed countries and higher in developing countries. It means that there is a close relationship between the level of economic development and rate of population growth.

The rate of population growth depends upon birth and death rates. It has been observed that economically under developed regions have higher birth rate but due to economic backwardness they have high death rates too. Thus the population grows at a slower rate. This is the first stage of demographic transition. With the economic development health facilities are developed and death rate drops down but birth rate still remains quite high. This results in high rate of population growth. Thus many African, Latin American and South East Asian countries are in the second stage of demographic transition. The third stage of demographic transition is characterised by a drop in the birth rate resulting in decrease in the population growth. This situation prevailed in Japan after the second world war. Chile, Bolivia and Angola are in this stage of

TABLE 13.1
Regional Pattern of Population Growth Rates

<i>Region</i>	<i>Population (in crores) 1984</i>	<i>Average annual growth rate in percentage (1980-84)</i>
<i>World</i>	<i>476.3</i>	<i>1.7</i>
<i>Africa</i>	<i>53.7</i>	<i>3.0</i>
Western Africa	16.3	3.1
Eastern Africa	15.5	3.2
North Africa	12.1	2.9
Central Africa	6.1	2.7
Southern Africa	3.6	2.5
<i>America</i>	<i>65.8</i>	<i>1.7</i>
North America	26.1	0.9
Latin America	39.7	2.3
South America	26.3	2.2
Central America	10.3	2.7
Caribbean	3.1	1.5
<i>Asia</i>	<i>277.7</i>	<i>1.7</i>
East Asia	123.9	1.1
China	105.2	1.2
Japan	11.9	0.6
Other East Asiatic Countries	6.7	1.8
South Asia	153.9	2.2
Southern Asia	103.6	2.2
South-Eastern Asia	39.3	2.1
West Asia	11.0	2.9
<i>Europe</i>	<i>49.0</i>	<i>0.3</i>
Western Europe	15.4	0.1
Southern Europe	14.2	0.6
East Europe	11.2	0.4
Northern Europe	8.2	0.1
<i>Oceania</i>	<i>2.5</i>	<i>1.5</i>
Australia + New Zealand	1.9	1.2
Other Oceanian Countries	0.6	2.5
<i>Soviet Union</i>	<i>27.6</i>	<i>1.0</i>

Source: UN Statistical Year Book 1984, UN New York 1986 p 6

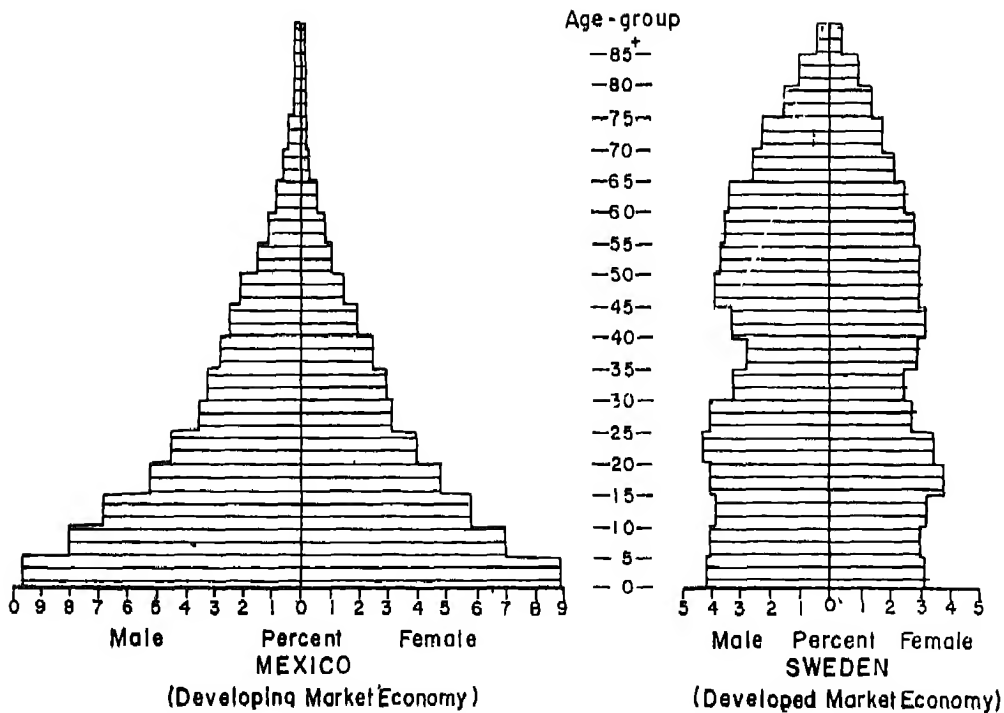


FIG. 13.2 Age-Sex pyramid

transition. In the fourth stage of demographic transition, the rate of population growth becomes very low. Some countries experience zero growth rate, for example in 1984, Austria experienced zero percent growth rate. United States of America, European countries, Soviet Union, Australia and New Zealand etc. have already reached the fourth stage of demographic transition.

Demographic Structure

Sex ratio, age composition, literacy rate, occupational structure are some of the aspects of demographic structure which can be measured and are quantifiable.

Age and Sex Ratio

Age is an important component in demographic structure. If the number of children is large in the population of a country, the chances of the increase of population in future are more. The potential availability of labour is also high. If the number of children in the age-group of 0-14 Yrs, and of the people above 55 years of age is large, it would mean that the size of dependent population is large.

The size of population in lower age groups is large in those regions where birth rates are higher e.g. in Africa, Asia and Latin America. Wherever life expectancy is low, the number of old people is also low. In those countries where birth

rate is low but life expectancy is high, the number of children is lower but the number of older people is higher.

Sex ratio refers to the ratio of males and females. It is measured in terms of number of males per thousand females.

In those countries, where death rates of male and female children are similar because equal care is taken in bringing up the male and female children, the sex ratio is generally balanced. Besides the differential birth and death rates, the male out migration also causes imbalance in the sex ratio. The sex ratio in different countries has

been presented in the table 13.2

It is clear from the data that in Europe, the number of females per thousand males is more. The same situation prevails in Africa too but the causes for high sex ratio in both the regions are different.

Age-Sex Composition

Age and sex ratio is very well represented by age pyramid. In most of the developing countries, the base of the age-sex pyramid is found to be broad and the apex to be narrow. It means children are

TABLE 13.2
Sex Ratio in the World

(Females per 1000 males)

<i>Region</i>	<i>Sex Ratio</i>	<i>Region</i>	<i>Sex ratio</i>
World	933	East Asia	965
Africa	1,017	South Asia	955
Western Africa	1,014	South east Asia	1,011
East Africa	1,030	South West Asia	960
Central Africa	1,038	Europe	1,051
North Africa	982	Western Europe	1,068
Southern Africa	1,062	Southern Europe	1,044
América	1,016	Eastern Europe	1,037
North America	1,050	Northern Europe	1,050
Latin Ame América	995	Oceania	983
Central América	979	Australia and New Zealand	909
Caribbean	1,000	Soviet Union	1,137
Asia	960	India	935

more and older people are less in numbers. In France, Sweden and some other European countries the base and the central part of the pyramid are of the same width which means that the number of children and middle aged people are the same due to low birth rate. Age pyramid also reflects the future trend of the population in an area. Study the age pyramids for Sweden and Mexico. Discuss the composition of the pyramid and explain the differences in the trends in both countries. The availability and maturity of human resources depend upon size of the population between 15 to 55 years of age. Therefore, significant clues for human resource planning can be obtained by studying these pyramids.

Literacy

Besides the size of population, the quality of human resource is an important aspect. Literacy reflects that social aspect of population by which its quality can be ascertained. There is a wide variation in the literacy rates in the world. The literacy is higher in urban areas as compared to rural areas throughout the world. Likewise the female literacy in rural areas is much lower than the female literacy in urban areas. The female literacy in Muslim countries is also low. Major factors influencing literacy rate are, level of economic development, level of urbanisation, standard of living, the status of females and other groups in the society, the availability of educational facilities and the policies of the government. Level of economic development is both a cause and an effect of literacy. Higher level of literacy reflects higher level of economic development. The developed and urban economies have higher literacy rate as well as standards of education. The agricultural economies and these with preponderance of primary sector have low level of literacy and educational development.

According to 1981 census, the literacy rate in India was 36.2 per cent. There is a wide gap between male and female literacy rates, which were 46.9 and 24.8 per cent respectively.

Urban and Rural Population

The population is divided into urban or rural on the basis of the residence. The urban population increases due to natural growth as well as due to migration of people from rural areas. The higher employment opportunities, availability of different types of social facilities and higher standard of living in urban areas attract the rural population. High urban population is an indicator of economic development of a country. Most of the developed countries have higher proportion of urban population e.g. United States of America, Canada, United Kingdom and Belgium have 74, 77, 92 and 97 per cent of urban population respectively. On contrary, countries with lower levels of economic development such as Ethiopia, Tanzania, Kenya, Bangladesh, India and Pakistan respectively have 15, 14, 20, 18, 25 and 29 percent of their total population as Urban population. Generally, industrially developed countries have higher share of urban population as industrialisation and urbanisation are positively correlated. There is preponderance of rural population in agricultural countries.

Occupational Structure of Population

Occupational structure of population refers to the proportional distribution of people under specific economic activities in any region. United Nations has identified the following categories of occupations.

- Agriculture, forestry, hunting and fishing;
- Mining and quarrying;
- Manufacturing industry;
- Construction;
- Electricity, gas, water and health services;
- Commerce;
- Transport, storage and communication services;
- Unclassified occupations.

This classification is essential for international comparisons but each country classified its pop-

ulation in different occupational categories according to its own needs.

In India, according to 1981 census, the economically active population has been divided into main workers and marginal workers. Main workers have further been sub-divided into cultivators, agricultural labour, labour engaged in cottage industries and other workers.

There are vast differences in the occupational structure of developed and developing countries. The proportion of workers engaged in primary sector is very low in developed economies e.g. United States of America, Canada, United Kingdom, France, Federal Republic of Germany have 4, 5, 9 and 6 per cent of their work force engaged in agriculture respectively. Higher proportion of work force is engaged in industry, transport, trade and services. A very large proportion of work force in developing countries is engaged in primary sector, e.g. according to the data of 1980 census, the percentage of working force in agriculture in Ethiopia, Kenya, Tanzania, Bangladesh and China were 80, 81, 86, 75 and 74 respectively. According to 1981 census, 66.5 per cent of work force in India was engaged in agriculture.

Population Growth and Economic Development

The population growth of a country has both positive and negative effects on its economic development. Whether the effect will be positive or negative will depend upon the stage of demographic transition in which the country is passing through. The quality and size of population are important factors in utilisation of resources and production.

The quality of work force is closely related with standard of living which in turn can be attained through higher per capita income. If the size of the population in a country is small and per capita income is high, the utilisation of resources is more efficient. In the low per capita income countries where size of population is large, the rate of development is very slow. Man is a producer as well as a consumer. If his number rises, national income must also grow. If only the numbers of people grow and the national income does not rise, per capita income falls down. Income is closely related with standard of living. The standard of living goes down with the fall in income and the demand for goods and services also goes down. This obstructs the development. Population is necessary for development but the pressure of population in developing countries has slowed down the pace of development. The questions of poverty, unemployment, disparity, malnutrition and many other social ills are related to the imbalance between population and means of subsistence.

It is believed that if the rate of development is high, the growth rate of population is low (that is why the slogan of "Development is the best contraceptive" was given in Geneva conference). This explains the lower population growth rates in developed countries as compared to the developing countries. The growth rate of population in developing countries is still about 3 percent or more per annum. Contrary to this, the population growth rate in developed countries is less than 1 per cent per annum. It seems logical that the high rate of population growth can be controlled only by accelerating the pace of economic development.

EXERCISES

Review Questions

1. Answer the following questions briefly:

- (i) Discuss the pattern of population distribution in the world.
- (ii) What are the factors influencing the distribution of population? Explain with examples.

- (iii) Discuss the pattern of population growth in the world. Give reasons for the variations in the growth rates in different regions.
- (iv) What do you mean by age-sex ratio? What is its significance in the population structure of region?
- (v) What do you understand by the occupational structure of population? Name the occupational categories in India adopted in the 1981 Census.
- (vi) How does the population growth influence the economic development?

Cartographic Work

2. Population growth rates of some of the developed and developing countries have been given in the table below. Represent the data with a suitable diagram. Why are there differences in the growth rates of developing and developed countries?

**Population Growth rates in some Developed and
Developing Countries
1980-84**

<i>Country (Developing)</i>	<i>Population Growth rate (in per cent)</i>	<i>Country (Developed)</i>	<i>Population Growth rate in (per cent)</i>
Libya	4.5	Austria	0.0
Swaziland	4.3	German Democratic- Republic	-0.1
Somalia	4.1	Italy	0.3
Kenya	4.1	Soviet Union	0.9
Jordan	3.7	United Kingdom	-0.1
Pakistan	3.1	United States of America	1.0
Saudi Arabia	4.1	France	0.6

- 3. Show the statewise population density on the map of India according to 1981 census
- 4. Draw an age and sex pyramid for India according to the data of 1981 census.

CHAPTER 14

Settlements

SHELTER is one of the basic needs of human beings. Sometimes they construct their houses away from each other but at times they make them in clusters. The permanent houses have given rise to permanent settlements. These settlements came into existence at a time when man opted for agriculture as a sedentary occupation and linked himself with a part of land. Two facts are responsible for the growth of permanent settlements. Firstly, crop production required constant care of the farmers, especially at the time of their growth and ripening. Therefore, the farmers had to settle permanently near the fields. Secondly, the farmers learnt to produce sufficient food from the crops. They were able to support themselves upto the next harvesting season by proper storage of the surplus food grains produced from the field. Therefore, they were not required to wander around in search of food and they settled down at one place. Besides, man is gregarious by nature and likes to live in a group. Settlements are generally divided into two types; urban and rural.

URBAN SETTLEMENTS

Man, according to his place of residence, is either urban or rural. The population which lives in urban centres is known as urban population and those living in rural areas is known as rural. Urban settlements are differentiated from the rural settlements on the basis of certain charac-

teristics.

Size of the population

In almost all the countries, the census departments have taken size of population as a criterion to designate a settlement as urban. For example, any place in Denmark, Sweden and Finland having more than 250 persons will be called urban. In Iceland, it has to be more than 300 persons. In Canada and Venezuela any settlement with 1000 persons qualifies to be called as urban. In Colombia the lower limit is 1,500 persons, in Argentina and Portugal 2000 persons, in USA and Thailand 2500 persons and in India 5000 persons. In India, besides the size of population, its density is an additional condition, which is about 400 persons per sq. km.

Economic Basis

In certain countries, besides the size of population the basis of urban settlement is its economic structure e.g. in India, the urban settlement should have more than 75 per cent of its work force engaged in non-agricultural activities.

Administrative Basis

The way an urban settlement is administered is also a basis for its identification. In India an urban settlement must have a municipality, cantonment

board or be a notified area. In some countries any administrative centre is called an urban centre irrespective of its size. In Central American countries, Brazil and Bolivia, even a very small administrative centre is an urban settlement.

Form of the Town

Every urban centre has its own form. It has its own personality and character. Its individuality and uniqueness is attributed to the site where it is located. The form of a town is decided by the following facts that the shape of the town e.g. circular, square or elongated; the skyline of the town which is demarcated by important buildings and other significant features; and the structure of the town i.e. its internal structure and land use.

The shape of the town is a product of its site. The towns located on flat plains are different from hill towns. If a town is developed after proper planning, it has a regular shape but a haphazard growth always gives an irregular shape.

Jaipur and Chandigarh are regular in shape as both have been built according to a proper plan but the shape of Jodhpur is irregular. Defence was a major consideration in siting the towns in olden days. Forts were always built on higher land. A number of towns in Rajasthan have developed around forts. Most of the towns in Uttar Pradesh have developed around a clock tower which generally occupied the central point in the town. All the towns located on the riverbanks have elongated shape as they have developed along the bank lineally. The towns sited on the sea coast are either crescent shape or elongated in a linear fashion, because the sea front is the basis of their development.

Structure of the Towns

The land use throughout the towns is not uniform. In some parts of the town, commerce is a major activity e.g. Chandni Chowk, Khari Baoli and

Sadar Bazar in Delhi, New Market and Bara Bazar in Calcutta, Aminabad in Lucknow and Mahatma Gandhi Road in Ernakulam etc. Industries are concentrated in some parts and in certain areas sub-urban features predominate

Some urban geographers opine that the town develops around a core, hence different land uses are found in concentric circles. Thus, five types of land uses are found from the core towards the periphery.

Central core is occupied by wholesale commercial establishments. In the second zone, besides wholesale trade some light industries are also located. Most of the slums of the town occur in this zone. Third zone is devoted for the residential quarters of labour and people of low income group because the labour working in light industries live in this zone. The people belonging to middle and high income groups have their residences in the fourth zone. This zone has some sub-urban characteristics. The elite and people of very high income group live in the fifth zone. Most of these people own their vehicles. They come to the town to work during the day and return to this zone in the evening.

This structure of the town is not static. Depending upon the age of the town, the land use pattern changes with the changing needs. In the modern times industries are located away from the town because of their polluting characteristics. The land values and high rent is the reason for using the central part for commercial and trade purposes rather than for residences. Modern city is so large in extent that each colony has assumed the size of a town. Pressure on civic facilities, such as water supply, electricity and health services, congestion, noise and air pollution etc. have created difficult problems for the urban dwellers.

Functional Classification of Towns

You may have fixed ideas about towns and cities either on the basis of your own experiences of

living in a town or on the basis of information gathered from other sources. Jamshedpur is known as an industrial town but Varanasi is famous as a religious centre. Calcutta, Madras, Bombay, Cochin etc. have developed as ports. It means that a town is known for its functions. Many towns and cities are multi-functional. These functions may change from time to time. Many industrial towns of today were simple marketing towns (hats) in the past. The following types of towns can be identified on the basis of their functions.

Administrative Towns

These towns are the headquarters of the administrative departments of Central or State governments. The National capitals such as New Delhi, Canberra, Moscow, Beijing, Addis Ababa, Washington, D.C., Paris, London etc and state capitals in India such as Jaipur, Bhopal, Patna, Trivendrum, Imphal, Hyderabad, Bangalore etc. are administrative cities.

Defence Towns

These towns are the centres of military activities. These are of three types. *Fort towns* in North India, such towns generally have the word garh tagged with their names e.g. Aligarh. However there are other towns where in spite of forts, garh has not been tagged with their names e.g. Allahabad and Jodhpur. *Garrison towns* are those where the army contingents are posted. The mohallas known as Paltan Bazar and Urdu Bazar in many towns in India show that either armies were posted there or the army people did their shopping in those areas. A good example of garrison town is Mhow in Madhya Pradesh near Indore. It is the abbreviation of Military Headquarter of War. *Naval Bases* have also developed in some parts of the world as large towns e.g. Cochin and Karwar

Cultural Towns

There are different types of cultural centres but

two types are important. Religious Centres such as Ayodhya, Jerusalem, Mecca, Hardwar and Varanasi have their origin because of religious gatherings. Some places have become famous because of educational institutions and they are called educational centres. Varanasi, besides being religious centre, has been an important seat of learning. Oxford, Cambridge and Allahabad have been famous for their educational institutions. Aligarh is a small town but has assumed importance due to its university.

Towns Based on Economic Activities

Many towns have developed as trade centres and industrial agglomerations. These are of the following types. Towns which have developed in mineral rich areas due to mining activities such as Dhanbad, Khetri, Kalgoorlie, Coolgardie etc. are called mining towns

Towns which have developed due to setting up of industries such as Jamshedpur, Kanpur, Durgapur, Birmingham, Pittsburg and Youngstown etc. are called industrial towns. Most of the older towns were centres of exchange of goods which are known as *trade centres*. Dusseldorf of Federal Republic of Germany, Winnipeg of Canada, Lahore of Pakistan, Baghdad of Iraq and Agra in India have been important trade centres. Some towns have developed as transport towns. Two types of transport have been responsible for the development of such towns. Port Towns are the centres of imports and exports and are located on the sea coasts. Harbours have been made for the anchorage of large ships. Transport and trade are the main sectors which offer employment to large numbers.

The junctions of rail routes develop into urban centres later on. Mughalsarai and Itarsi are appropriate examples of such towns. Recreational or tourist towns are created by the decision of the government in a planned way for specific function such as administration. These do not have ancient roots in the historical past, for example, Chandigarh in India, Islamabad in Pak-

istan, Brasilia in Brazil etc. Most of these towns are either national or regional capitals.

RURAL SETTLEMENTS

The village as a form of settlement is closely related to agriculture. Metaphorically speaking, village grows from the soil. In India, the concept of a village deity (Gram devi/devata) is always associated with the existence of a village. Rural settlements are of two types—compact and scattered

Compact Settlements

In such settlements many houses are built in close vicinity to each other and many households live in these houses. They keep their animals also in a part of their houses. They work in the fields

during the day and come back to the village in the evening. Such settlements can be frequently seen in river valleys and fertile plains. The houses are closely spaced and streets are narrow. The people are closely knit in a social bond

Scattered Settlements

These settlements are generally found in hills, plateaus and highlands. These are formed of one or two dwelling units knitted together with a common bond. In Africa the church and the mosques provide such bonds for these scattered settlements. There are numerous such settlements on the Ethiopian highlands, and in Himachal, Sikkim and North Bengal.

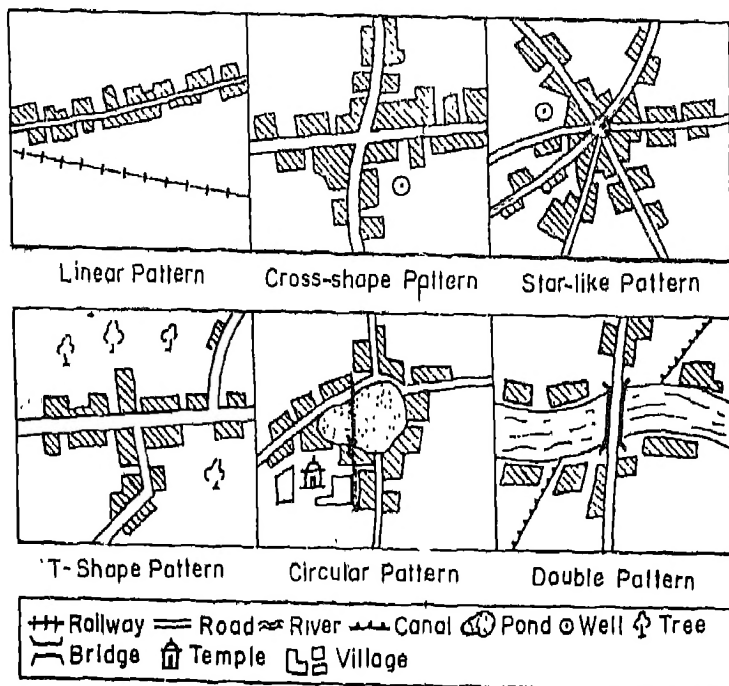


FIG. 14.1 Types of rural settlements

The Pattern and Functions of Rural Settlements

The pattern of rural settlements responds to environmental conditions and, therefore, differs from one environment to the other. Generally, three patterns of rural settlements are found; circular and square, linear and cross shaped settlements.

Square and Circular Settlements

Square or rectangle shaped villages develop in flat, level lands, around a pond, tank, or crater. In Bengal, village tank (Pokur) is a common feature. In Uttar Pradesh, the village tank develops on one corner because the mud, for building these houses, is brought from there.

Linear Settlements

These settlements develop along either side of roads, rivers or canals. The flood plains of rivers in hilly terrains are also occupied by linear settlements.

Cross Shaped Settlements or Settlements developed Along Cross-Roads and Tri-Junctions

The patterns and forms of these settlements are determined by the nature of the junction of two or more routes.

Sometimes the routes meet in such a way that they make a 'T' Junction. People start making their houses along the routes extending in all the three directions.

Sometimes two routes cross each other at right angles. The houses are built along the routes in all the four directions.

Where many roads, or routes join together, star-shaped settlement emerges.

Functions of Rural Settlements

The form of a rural settlement is determined by

production. The main occupation in a village is agriculture. Villages, generally, have all such services and facilities which are related to agriculture. Some large villages have a few small shops which sell the goods against the payment of money as well as grains. All the villages in India have panchayats which perform administrative functions. Villages located near the forests have forestry as their main function while it is fishery for those located near the water bodies. Few big villages provide specific services to the surrounding villages. With the mechanisation of agriculture, many villages have developed expertise in repairing agricultural machinery and implements.

Town Village Inter-relationships

It is said about most towns that 'villages which succeeded' became towns but it is not necessary that every town was a village once upon a time. Many towns are new and have been planned. There is neither a conflict nor competition among urban and rural settlements. They are in fact complimentary to each other. The villages supply the foodgrains required in the towns while towns supply the industrial goods demanded in the villages. Towns and villages are linked with the means of transportation. There are four types of inter-relationships which develop between rural and urban settlements.

Trade Relations

The villages located in the hinterlands of the town send their marketable surplus to the towns for sale. The commodities moving from villages to towns consist of agricultural and animal products. The towns supply the villages with industrial products.

Social Relations

The towns have different cultural institutions which the villages make use of. Exhibitions, fairs,

cinema and theatres are some of the facilities which are shared by villagers for their recreation

Commuting Relations

Many people from villages come to the town for work. They commute every day. Such a relation is mutually beneficial to both villages, as well as towns.

Agricultural Relations

The village farmers adjust their cropping pattern

in response to the demand of agricultural products in the towns. The cultivation of vegetables and fruits in the close vicinity of the towns is a good example of such an adjustment. The farmers get the seed and fertilisers from the towns. Agricultural implements and machinery are repaired in shops located in towns. Such facilities are also available in some large villages. The villages and towns are bonded together in a system of interdependence which provides strength to the existence of both.

EXERCISES

Review Questions

1. Answer the following questions briefly.
 - (i) Discuss the reasons for the development of human settlements.
 - (ii) Why certain settlements are called towns?
 - (iii) What do we mean by structure of towns? Discuss.
 - (iv) Classify towns on the basis of their functions. Illustrate with examples.
 - (v) Which are the major patterns of rural settlements?
 - (vi) Discuss the inter-relationship between rural and urban settlements.
2. Distinguish between;
 - (i) Compact and scattered settlements
 - (ii) Villages and towns

Cartographic Work

3. Draw a map of your village or mohalla and divide them into different functional zones

